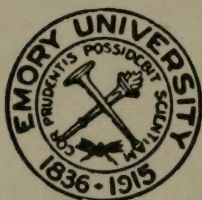


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BY ROBLEY DUNGLISON, M. D.,

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GENERAL THERAPEUTICS

AND

MATERIA MEDICA.

CHAPTER III.

OF MEDICINES.

SECTION VI.

AGENTS THAT AFFECT VARIOUS ORGANS.

II. TONICS.

SYNON. *Confortantia, Corroborantia, Confirmantia, Roborantia.*

Tonics differ from excitants—The former defined—Modus operandi—Tone, and want of tone, on what dependent—Tonics, direct and indirect—Bitter extractive the great tonic principle of vegetables—Tonics given with two great views, to strengthen the system and to break in upon morbid catenations—Therapeutical application of tonics—In febrile diseases—In inflammatory disorders—In the neuroses—Mental tonics—Special tonics.

THE excitants, considered in the last division, are diffusible in their action, and transient in their effects—the stimulation being followed by a degree of depression proportionate to the extent of such stimulation. They excite, therefore, beyond what may be considered as the healthy standard. The substances, which are now to be investigated, as a general rule operate silently and permanently. They are followed by no undue depression, when discontinued; and they may be employed in states of the system in which the use of Excitants proper might be questionable. Accordingly, when the practitioner is in doubt, whether the case before him will admit of stimulation; and the weight of evidence urges him to that course, he usually prefers commencing with a slightly stimulating tonic—to beginning at once with the diffusible exci-

tants;—knowing that the former may be discontinued without detriment, whilst the latter can only be cautiously pretermitted, especially if their employment has been persevered in for some time.

Tonics are usually defined to be:—Agents, which give strength and vigour to the body. In this point of view, all strengthening aliments might fall under the division. These are, in reality, tonics; but, as before observed, the consideration of aliments is not comprised in the objects of this work. It has been attended to elsewhere, (*Human Health*, p. 179).

By many therapeutical writers, tonics have been conceived to act by improving the tonicity of the muscular system; and, in the classification of Dr. A. T. Thomson, they are separated from excitants proper, and classed with astringents, under the head of—"Vital agents, influencing the body generally by operating directly on the muscular and sanguiferous systems." Yet, he subsequently affirms, that tonics "act on the vital principle through the medium of the nerves, and as far as their mode of operating is understood, we may regard them as excitants."

To elucidate his idea on the *modus operandi* of tonics, he has the following observations:—"When an individual is in good health and in vigour of body, the muscles or moving organs feel firm and tense; they act regularly and powerfully, whether they are involuntary muscles, or those under the control of the will. This is a state of *healthful tone*. On the contrary, when the muscles feel soft and flabby, when the action of the involuntary muscles is languid, and the voluntary do not rapidly respond to the will; when there is a strong inclination for rest and indulgence; and when the movements of the body or its parts are performed with difficulty, this is a state of *deficient tone* or *debility*. That both these states are connected with the condition of the muscular fibre may be demonstrated by detaching a muscle from the bodies of two animals in these opposite conditions, and ascertaining its strength by appending weights to it: the muscle taken from the healthy animal, or that in a state of *tone*, will sustain a much greater weight than that which is in the opposite state. Thence, to a certain extent, *tone* implies a difference in the mechanical condition of muscles; a greater degree of density and cohesion of their component fibres; but this must be also joined with *elasticity*, that is, the power of resisting extension, and of restoring itself when the extending cause is removed, before the part can be said to be in the state of perfect tone. That this state is truly the result of vital energy is evident; for the same muscle loses the power of sustaining the weight, which it supported when first cut from the body, and this in proportion to the distance of time from that of its separation from the living body,"—and he adds: "medicines or medical agents, which produce this state of healthful tone, and renew the *tension* and vigour of the muscular fibre, are thence denominated *tonics*."

Sir Gilbert Blane also asserts, that no muscle, whether voluntary or involuntary, can act unless its fibres are previously in such a state, that if divided they would shrink by their own resiliency, leaving an interval between the cut extremities; and Dr. Paris—after citing the above remark of Sir Gilbert—observes:—"It appears, that there are certain medicinal bodies, that have the power of effecting this state of tension,

and when their effects contribute to its restoration, they are properly denominated *tonics*." Yet this resiliency, described by Sir Gilbert, is not necessarily even a vital manifestation. It may be independent of the vital properties. It continues for some time after the total extinction of life in all its functions: appears to be connected simply with the physical arrangement of the molecules; and is not affected until the progress of decomposition has become sensible. Hence, it has been properly regarded, by Haller and others, as a *vis mortua*.

Flexibility, extensibility, and elasticity are variously modified, and combined in the different forms of animal matter; and they exist to a greater or less extent in every organ. Elasticity is only exerted under special circumstances. The tissues, in which it is inherent, are so disposed through the body as to be kept in a state of extension by the mechanical circumstances of situation, but, as soon as these circumstances are modified, elasticity comes into play, and produces shrinking of the substance. The gaping wound, produced by a cut across a cooked shoulder of mutton, is an example, familiar to all, of this elasticity or resiliency. Previous to the division, the force of elasticity was kept neutralized by the mechanical circumstances of situation, or by the continuity of the parts; but, as soon as this continuity was disturbed, or, in other words, as soon as the mechanical circumstances were altered, the force of elasticity was exerted, and produced recession of the edges. This property of elasticity has been called *contractilité de tissu*, and also *tone* or *tonicity*;—names which have probably suggested the *modus operandi* assigned to tonics, which we have been discussing.

That diminished cohesion, like that adverted to, may occur as the result of disease is doubtless. Pathology affords us numerous examples of it, although not so many as is usually supposed; and it is by no means easy to see, that such a pathological condition must always exist, when tonics are indicated, or whenever they prove beneficial. The only way, it would seem, that these agents can act on the muscles, is on their contractility, like excitants; and indirectly on their nutrition, through the medium of the nerves distributed to the stomach;—the irradiations being conveyed from thence to every part of the nervous system; and therefore to every portion of the frame endowed with nervous influence.

Want of tone appears to depend, in the majority of cases, certainly, —on exhaustion of muscular contractility, and on impaired nervous influx. Physiology and pathology afford us numerous examples in support of this position; but it will only be necessary to refer to a few.

The *cænæsthesis* or *common feeling* of many people is so much influenced by the condition of the atmosphere, that they become almost barometers,—feeling light and buoyant when the air is clear and dense; and gloomy, when it is moist and light. Again, if the bowels be loaded, the powers of the system are, at times, so depressed, that general languor and lassitude prevail; and the individual is incapable of the slightest muscular effort. In like manner, after continued exertion, fatigue is felt, and rest absolutely demanded, until the exhausted excitability has been recruited; and, lastly, if a man, previously in perfect health, be struck with the contagion of a malignant fever, he finds his

strength dissipated, and that he is incapable of raising as many ounces as he, a short time previously, could raise pounds. In none of these cases, can we presume that the mechanical condition of the muscle is materially changed. In the cases of the varying atmosphere, the loaded bowels, and the impression of malignant fever, the feelings of debility must be regarded as wholly dependent on the condition of the nervous system; and in that of great fatigue after protracted exercise, on the exhaustion of the muscular contractility under the perpetual excitement produced by the repeated efforts of volition,—the nervous influx exhausts the muscular contractility or excitability like any other stimulus.

How strongly want of tone is connected with the state of the nervous system is seen in the depressing influence of *nostalgia* or *homesickness*, in which every voluntary function is carried on in languor and asthenia; and, on the other hand, we are equally struck with the evidences of strength, which the maniac exhibits. In such cases, the delicate muscles of the female execute feats, which the largely developed muscles of the athletic male, under the ordinary or healthy nervous influx, would be incapable of accomplishing. The effects, too, of mental tonics must manifestly be exerted on the brain, in the first instance; and, through the medium of the nerves, on the rest of the body.

Under the salutary nervous excitation, which tonics are capable of effecting, the action of the capillaries over the whole system becomes augmented; nutrition is increased and the *vis insita* elevated to the full healthy standard.

It is probable, that all tonics are obscurely stimulant; but they differ, as before remarked, from excitants proper, in not stimulating to a marked degree, and in the excitation not being followed by corresponding depression. They exert, however, no perceptible stimulation: their action, though efficacious, is silent; and, if they be repeated at proper intervals, a permanent, healthy state of tone results. But all this is produced through the agency of the tonic upon the nervous system; and there does not appear to be any satisfactory reason for believing, with Dr. Chapman, of Philadelphia, that tonics, “like every other class of medicines, are endowed with some properties peculiar and distinctive, among the most conspicuous of which is their specific affinity to the muscular fibre.”

Tonics may be either *direct* or *indirect*;—that is, they may be the means of adding directly to the healthy tone of the system, in the mode described; or, in particular conditions of the economy, other substances belonging to different classes of therapeutical agents may exert a tonic effect indirectly. In this way, blood-letting, cathartics, emetics, &c., may be indirect tonics. In the state of apparent debility, which accompanies febrile or other irritation, and in that in which the stomach or intestinal canal is loaded, and the nervous system oppressed and depressed, a remedy, which obviates these conditions, will remove the debilitating effects of such conditions, and prove tonic. When, however, we use the term *tonic* abstractedly, we never apply it to those indirect agents.

It has been a question, occasionally agitated by therapeutists, whether

there be any such thing in nature as a real tonic; or, in other words, whether any remedial agent can, by virtue of properties inherent in it, communicate tone where tone is defective. It would appear, that no such properties are possessed by any agent; or, in other words, that no principle is infused into an asthenic organ or tissue, which can give strength to it. The whole effect is exerted, directly or indirectly, on the nerves of the stomach; whence it is distributed, by means of the nerves, to every part of the system. It is probable, too, that some of the articles of the class are absorbed, and act upon the organism through the altered character of the blood in the capillary blood-vessels. Such, it has been conceived, is the *modus operandi* of the preparations of iron in chlorosis and other affections. Some tonics, again, are insoluble, and pass,—apparently unaltered,—through the digestive tube, appearing to exert their influence like certain condiments, which contain no nutriment, but which place the chylipoietic organs in a condition for deriving a larger amount of nutriment from alimentary matters taken along with them than they would otherwise have been able to separate.

When a tonic is administered in disease, its speedy operation is not to be expected. This is one of the essential points of difference between tonics and excitants proper. The effects—as already remarked—are gradually, and almost insensibly exhibited; and they afford as good specimens of the action of what have been termed ‘*alteratives*,’ as any that could be selected. They produce no sensible evacuation. Under their employment, the appetite gradually improves; the impressibility of the nervous system—often induced by long protracted indisposition, or by a rapid reduction of the vital forces, as in acute diseases—lessens; the action of the circulatory system assumes the healthy standard; the general feeling exhibits itself buoyant and elastic; and the muscular powers, under the improved nervous influx, resume their wonted energy. But all this denotes only a restoration to the healthy standard; hence, the great use of tonics in convalescence; but if administered in conditions of the system in which they cannot be expected to do good, they are devoid of the injurious consequences, that follow the undue use of excitants proper, and their administration may be arrested at any moment without fear of debility resulting. It has been already seen, that it is the use of diffusible stimuli, which is alone followed by corresponding depression.

Bitter extractive appears to be the great tonic principle of most of the vegetable tonics; aided, in some, by the presence of aromatic oil, which renders them more stimulating; in others, by the presence of one or both of the great astringent principles of vegetables. This bitter extractive is not affected by heat; but the aromatic oil is, provided the boiling temperature be maintained for some time. Decoction is, therefore, an improper mode of preparation, where the object is to retain the aromatic property. Infusion is the form most commonly prescribed; and hence the pharmacopœias contain officinal infusions of all the principal vegetable tonics.

Dr. Thomson asserts, that Dr. Chapman, and, following him, Dr. Paris, attempt to prove, that bitterness is essential to tonics; or, in other words, that it is *the* tonic principle; but in this, he does those writers

injustice. The latter gentleman affirms, that the tonics, derived from the vegetable kingdom, are *generally* bitter;—whilst the former expressly says:—"Concerning the element, which gives the tonic power, some difference of opinion has been entertained. Cullen supposed it to be the same quality as that of bitterness. But though it holds to a considerable extent, there would seem to be no necessary connexion in all cases. Exceptions at least are not wanting, as we see very strikingly in opium and digitalis, which are bitter, though not tonic; and, conversely, in many of the metallic articles, which, though tonic, are not bitter in the slightest degree." Nor do we think Dr. Thomson more accurate in his opinion, "that part of all the vegetable tonics are [is] digested in the stomach, and the principle, whatever it is, which produces their tonic influence, is thus separated from the other parts; and consequently it is enabled to act with more energy upon the nerves of the stomach:"—an explanation that can scarcely apply to infusions of vegetable substances; and still less to the active principles of such substances; nor is it more applicable to them when given in a solid form, as in the state of powder, in which the active principle is, in many cases, combined with little more than lignin or woody fibre. It is but necessary, that the fluids of the stomach, or any fluids, should come in contact with the substance in order to extract its tonic virtue; but nothing like digestion—as applied to the physiological process to which alimentary matters are subjected—is necessary.

Bitter extractive, as Dr. Paris has remarked, is a great natural tonic. It appears to pass through the body without suffering any diminution in its quantity, or change in its nature. No cattle will thrive upon grasses, that do not contain a portion of this principle; a fact, which is considered to have been proved by the researches of Mr. Sinclair, gardener to the Duke of Bedford, who remarks, in his "*Hortus Gramineus Woburnensis*," that if sheep be fed on yellow turnips, which contain little or no bitter principle, they instinctively seek for, and greedily devour, any provender, which may contain it, and if they cannot obtain it they become diseased, and die. "We are ourselves conscious," Dr. Paris adds, "of the invigorating effects of slight bitters upon our stomach; and their presence in malt liquors not only tends to diminish the noxious effects of such potations by counteracting the indirect debility, which they are liable to occasion, but even to render them, when taken in moderation, promoters of digestion. The custom of infusing bitter herbs in vinous drinks is very ancient and universal: the *potulum absinthiatum* was regarded in remote ages as a wholesome beverage, and the wormwood was supposed to act as an antidote against drunkenness. The Swiss peasant cheers himself amidst the frigid solitude of his glaciers, with a spirit distilled from *gentian*, the extreme bitterness of which is relished with a glee, that is quite unintelligible to a more cultivated taste."

Tonics may be given with one or two views;—either to make a decided impression on the nervous system, so as to break in upon a chain of morbid phenomena that supervene in paroxysms—as in intermittent fever; or to produce their silent but permanent operation for the removal of debility. The same form of preparation is not equally

adapted to the two cases. In the former, the lignin or woody matter of the vegetable may not be objectionable. On the contrary, it may assist the operation of the tonic principle, by exciting a new action in the nerves of the stomach; but, where the powers of the system, and of the digestive organs as a part, have been prostrated by long protracted indisposition, the vegetable tonics cannot be administered, with propriety, in powder,—as they are apt, by reason of the indigestible woody matter, to occasion great derangement of the stomach and bowels, and sometimes irritative fever. At other times, the bark accumulates in such quantity in the alimentary canal as to be discharged by the bowels for several days consecutively. In a case of this kind, that fell under the author's care many years ago, the most disastrous results were produced, apparently by the irritation excited in the system by the presence of this extraneous substance in the bowels. A young lady, of markedly scrofulous temperament, and predisposed somewhat to pulmonary consumption, was attacked with bilious fever, which was actively treated, and, in the course of three or four weeks, yielded: the resulting debility, however, was so great as to induce the practitioner to prescribe a tonic; and the cinchona was selected, and administered in powder. After she had taken it for some days, vomiting and purging occurred, accompanied with occasional chills of the most distressing character. Bark was discharged in quantities in the evacuations; and, under the irregular actions thus excited, tubercles—already probably present in the lungs—proceeded to softening, and this most rapidly; hectic fever, and every symptom attendant on the confirmed stage of pulmonary consumption, supervened, and she gradually sank under the malady;—yet no signs of phthisis were present prior to this derangement, produced by the bark in powder on a frame already debilitated by a previous malady.

Where the object of the practitioner is simply to strengthen the debilitated gastric functions, the powdered tonics should not, therefore, be chosen. Modern chemistry has presented valuable gifts to therapeutics, by separating the active principles from several of the tonics; and where this has not been done, simple infusion will generally extract all their virtues. The watery infusion is perhaps the best preparation;—the spirituous combining an excitant principle, which may not always be indicated, where tonics are; and it is well, where their administration has to be persevered in for a length of time, that the tonic should be varied. The system soon becomes habituated to the same agent; and, if another be substituted in its place for a few days, the use of the former may be resumed with its pristine advantage.

Therapeutical Application of Tonics.

In the therapeutical employment of tonics, it is important to inquire whether some may not be better adapted for fulfilling the indications that may suggest themselves than others.

Fever.—In febrile diseases, tonics cannot often be needed; and accordingly, they are not much employed. The remarks made regarding the use of excitants in fevers are applicable to tonics, except, that

the latter do not excite as much as the former, and, when cautiously used, not beyond the healthy standard. Simple tonics can, therefore, be prescribed, when excitants might be of doubtful propriety; and—as before remarked—if the symptoms do not improve under their administration, they can be discontinued at once, without any apprehension of the evil that might supervene on the sudden discontinuance of excitants. The vital elasticity is generally sufficient to restore the patient from the depression induced by fever; and when it is not, the use of excitants—and the same may be said of tonics—will not often be found effective. They can, indeed, act only on the excitability, that remains in the system. The practitioner, however, will never hesitate to have recourse to them in those malignant forms of typhus, met with in jails, camps, and in the filthy, unventilated houses of the destitute; as well as in every fever, whose symptoms approximate to such a condition. The sulphate of quinia, in the state of supersulphate, formed by the addition of a few drops of diluted sulphuric acid, is one of the most common agents prescribed in these cases; although the watery infusion of many of the tonics,—as columbo, and gentian—is often recommended, and by some preferred.

In the apyrexia of *intermittents*, tonics are the sheet anchor of the physician, to which he trusts implicitly. Their mode of operation, in preventing diseases characterized by periodicity, is by no means clear. The only plausible theory is, that they produce a new impression upon the nerves of the stomach, and through them on the nervous system generally; and that the new action, thus induced, is sufficient to break in upon the morbid chain that has been established. This view is, at least, strengthened by the fact, that a powerful emotion produces a similar antiperiodic effect with the tonic; may completely prevent an expected attack; and, even after its inception, remove it. Accordingly, fear is ranked, by many practical writers, amongst the antiperiodics to be employed in ague; and the efforts of the tractorizer, and the animal magnetizer, exert their influence in the same manner.

It is not easy to explain this effect on the mind, or, indeed, the action of any of the class of tonics, under the idea which M. Broussais entertained of the pathology of intermittents;—that they are intermittent gastro-enterites. “Every regular paroxysm of intermittent fever,” he remarks, “is the sign of gastro-enteritis, the irritation of which is afterwards transferred to the cutaneous exhalants, which produce the crisis.” Yet this state of gastro-enteritis is removed, and prevented by agents, which would scarcely seem appropriate for such a result;—for example, by the peppers, as well as by the whole class of aromatic tonics.

But, whatever objection may be made to the pathological views of M. Broussais on the subject of intermittents, his treatment is rational. It is, indeed, that which experience has shown to be most satisfactory. Intermittents, it is known, may wear themselves out; but, it is a long and tedious process. Antiphlogistics simply have been found to have no effect in breaking in upon them. However useful they may have proved in lessening the duration of one of the stages of the paroxysm, they do not prevent the recurrence of the attacks. The employment of vegetable or mineral tonics is demanded, if the object of the physician be to put an end at once to the disease. The following proposition

conveys aphoristically the ordinary treatment in intermittent fever,—a treatment which is sanctioned by the experience of ages, and is no emanation from the ‘physiological doctrine,’ but rather opposed to its inculcations. “The surest method for the certain cure of inflammations with periodical exacerbations, is, to treat them at first by antiphlogistics during the hot stage, so as to render the apyrexia complete; to continue this treatment after the paroxysm, if the apyrexia be not complete; to give the cinchona, or rather the sulphate of quinia, and the other tonics, during the whole apyrexia; to administer diffusible stimuli at the accession of the rigors, and to return afterwards to cooling drinks when the hot stage is developed.” (Broussais.)

It is only, however, when the apyrexia is complete, that tonics can be administered, with full advantage, for the cure of intermittents. If plethora exist, or if there be hyperæmia in any organ, these must be removed, before the antiperiodics are had recourse to; unless, indeed, in those old obstructions of the parenchymatous viscera, which occasionally present themselves as evidences of former attacks of malarious disease. In the pernicious intermittents, too, which prevail in some countries to so great an extent, as in the Maremma district of Italy, and in some parts of this country, cinchona seems to be required before there is a complete apyrexia, for the purpose of arresting, as early as possible, paroxysms that might prove fatal, by virtue of the irregular actions, the hyperæmiæ, which they are apt to induce in important organs. It happens, fortunately, that in these cases, there does not appear to be as much mischief induced by the premature administration of cinchona, or its active principle, as is often apprehended; although M. Broussais, in the propositions cited, has depicted some of the evils which he considers likely to be produced by it. There are many observing practitioners, who have administered cinchona, even in substance, a form in which it is most likely to disagree, in consequence of the quantity of insoluble woody matter, and who have been satisfied, that it has not added even to the intensity of the hot stage. Still less would this be likely to accrue from some of the more advisable forms of preparation.

The author has often administered cinchona in powder in moderate doses, both in the healthy and moderately excited state of the system; but without observing any augmentation of organic action induced by it.

It is a good general rule to lay down,—that prior to the administration of tonics, all local mischief must, if possible, be removed; for, even should these agents not augment the mischief, they cannot exert the necessary sanative influence upon the morbid catenation that keeps up the fever. In the enlargements of the spleen, however, that accompany, or succeed, intermittent fever, sulphate of quinia, and subcarbonate of iron, in large doses, have been found excellent remedies.

Remittent fevers have to be regarded much in the same light as the continued, in respect to the administration of tonics. Whilst the febrile irritation is nearly constant, or whilst there is no period when fever is almost, if not wholly, absent, they cannot generally effect a cure. The nearer the remittent approaches to an intermittent in its character, the

more beneficial will be their action. During the inflammatory period of the disease, antiphlogistics have to be relied upon exclusively; and as there is generally a strong disposition to hyperæmia in some important organ, during the continuance of the irregularity of functions that characterizes the remittent forms of fever, antiphlogistics have to be pushed to a greater extent than in simple fever. There are cases, however, of remittent fever occurring in highly malarious districts, which demand the use of the bark, or quinia, comparatively early;—the disease, from the first, not exhibiting any highly phlogistic character; and being apt to be attended with engorgements of internal organs, unless interrupted in its progress at an early period. In such cases, bark, or its active principle, has been found effectual.

Inflammations.—It need scarcely be said, that tonics are not indicated in inflammatory disorders, unless in those forms, and stages, in which excitants may be advisable. It has, however, been maintained by men of no small distinction in science, that they may be given with advantage in every stage of erysipelatous inflammation, as well as of acute rheumatism. So far as the author's experience goes, these affections differ somewhat according to the climate, or locality in which they occur; and hence, in part, the diametrically opposite views of treatment, at one time inculcated in London and in Edinburgh—the antiphlogistic medication being universally adopted in the one place, whilst the tonic was as universally had recourse to in the other. Much also depends upon the habit of the individual,—whether healthy or modified by intemperance, &c. In the latter case, the inflammation may be of, what is termed, the most unhealthy character; adynamic fever may be present, with, at times, every sign of absolute typhus, and tendency to gangrene. In such a condition, tonics are indispensable. The practitioner must, however, be always guided by the symptoms that present themselves, and by the nature of the lesion, in this way indicated; and if he practices soundly, he will find, that, occasionally, it is requisite to push antiphlogistics; whilst at other times the indication may be, to be equally active with tonics. Facts, in this case again, have shown, that tonics, although they may not always be productive of advantage, may still be administered with impunity.

The remarks made on erysipelas apply generally to acute rheumatism, which is essentially arthritis or an inflammatory condition of the fibrous structures surrounding the joints, accompanied by a singular anomaly,—that the skin, instead of being hot and dry, as in other fevers, is usually hot and bedewed with copious perspiration. In such case, tonics have been freely exhibited, and have been looked upon, by some practitioners, as more beneficial, from the commencement even, than antiphlogistics. The author has had numerous opportunities for witnessing the exclusive use of both these modes of treatment; and although he cannot agree, that the tonic medication has been always the best, he does not recollect having seen the symptoms, in a single case, aggravated under their prudent administration. A combination of the two modes has appeared to him most advantageous;—treating the disease, during the earlier period, by the ordinary antiphlogistics; and afterwards endeavouring to modify the condition of the nervous system by the

cautious employment of tonics, such as the sulphate of quinia. The whole disease is peculiar. It is not dangerous whilst the joints remain chiefly affected; and it only becomes so by the extension or translation of the rheumatic inflammation to more important organs. It has been the opinion of many eminent observers, that copious depletion favours this extension, or metastasis, whichever it may be; but proof is wanting. In our uncertainty, it is advisable not to be too officious, where, as already remarked, the disease is not situate in parts of vital importance, and usually terminates favourably, except under the supervision of the accidents just mentioned.

Hemorrhage.—As in inflammatory diseases tonics are manifestly contra-indicated, so are they in the active forms of hemorrhage, the management of which is essentially that adapted for inflammatory disorders; but in the less active varieties; in those that have been termed *passive*, in which there is loosened cohesion of tissue, and perhaps modified spissitude of the blood, so that it readily transudes through the coats of the vessels, the aid of all the forms of general excitants may be required. Tonics, on this principle, are employed in scurvy; and in febrile and other affections, accompanied with strong evidences of a passive hemorrhagic tendency.

Neuroses.—Many of the neuroses, being attended with considerable debility and mobility of the nervous system, require the employment of tonics. This is the case with *epilepsy*, which is more frequently dependent on this, than on any inflammatory, state of the nervous system. Not unfrequently, however, the disease is organic in its nature; or, in other words, arises from some lesion of the encephalon. In such cases, tonics are not adapted to afford relief; but the cases are not easy of discrimination; and a plan of treatment, adapted to the general condition of the system, is usually had recourse to. This, as the author has said, must generally be of a tonic kind.

The vegetable tonics are, in these cases, not equal to the mineral; and, of the latter, the nitrate of silver is to be preferred, perhaps, to any other. The author has succeeded in removing many cases of epilepsy by its means; but it requires to be persevered with for a considerable time: It will rarely be found to exert any decided efficacy before the end of the first month. The preparations of zinc, copper and iron, are likewise employed; but they are not usually as efficacious as the salt of silver.

In *chorea*, the hopes of the practitioner are placed almost entirely on the appropriate use of tonics, combined with cathartics to remove the torpid state of the intestinal canal, that prevails in the disease. Here, again, the mineral tonics are preferred; as well as in *chlorosis*, which commonly occurs in those in whom there is much torpor of the system,—characterized by pale and lurid complexion; languor; listlessness; depraved appetite; indigestion; palpitation, &c.

In *neuralgia*, employed as a generic name for a number of diseases, the principal symptom of which is a very acute pain, exacerbating, or intermitting, following the course of a nervous branch, extending to its ramifications, and seeming, therefore, to be seated in the nerve, the plan of treatment by chalybeates has been found the most satisfactory.

In this painful malady, one variety of which has been long known under the name *tic douloureux*, the greatest diversity of agents has been made use of;—bleeding, general and local; emetics; purgatives; rubefacients; vesicants; cauterants; anodynes; mercurial frictions; electricity; division of the nerve, excision of a portion of it, &c., &c.; but one of the most successful is, undoubtedly, the subcarbonate of iron, given in large doses,—for instance, in thirty or forty grains twice or thrice a day. This course of treatment, continued for a month or two, often relieves, and ultimately removes the much dreaded affection. The mode in which it operates is by no means clear. It is, of course, through the nerves of the stomach, that any new action must be induced in the nervous system generally, and in the nerves affected with neuralgia in particular. Since its first introduction into practice for this purpose, by Dr. Hutchinson, of Southwell, England, upwards of twenty-five years ago, the author has had repeated opportunities for exhibiting it; and often with the most happy results. A lady had suffered under the most excruciating hemicrania,—essentially an intermittent neuralgia of one-half the encephalon,—for which depletion, anodynes, counter-irritants, &c., had been used in vain. She was confined to bed for more than half her time and suffered intensely; yet the affection was completely removed by the use of the subcarbonate, and although it is now more than twenty years since the cure was effected, the symptoms have not recurred. He could allude to many similar cases.

Worms.—Bitters, and, indeed, the whole class of tonics, are anthelmintic, or unfavourable to the generation of entozoa within the body; but this subject occupies a distinct section. See ANTHELMINTICS. They are likewise found to be serviceable in many

Chronic cutaneous diseases, unaccompanied by febrile excitement, as in some varieties of strophulus, lichen, prurigo, psoriasis, &c., in which their efficacy is mainly perhaps exerted through the changes they induce in the blood; and through that fluid on the vessels of the affected parts,—acting, therefore, as eutrophics, rather than tonics.

Local diseases, &c.—The surgeon, where gangrene is about to take place in any part of the frame, places his main reliance upon the employment of tonics, administered internally, as well as applied to the gangrenous part, where this is practicable. For this purpose, cinchona, or its active principle, is found most effectual. In short, in all cases, in which the powers of the system appear to be below the true standard; or, where the action of the nervous system is particularly impaired; where the skin is pale; the pulse feeble; the solids loosely cohering; and the ordinary indications of cachexia are present, tonics are demanded; and even in cases where the practitioner, owing to evidences of general febrile or local irritation, is doubtful whether they may be productive of advantage, he may venture upon their administration, when he would be afraid to use excitants. Too much dread is generally inculcated, and entertained regarding them. The remarks of Dr. A. T. Thomson, on this point, are extremely just, and apposite. “Upon the whole,” he says, “it is necessary that tonics should not be confounded with stimulants; and although it is proper to prescribe them with caution in any form of fever complicated with local inflam-

mation, yet we ought not to be prevented by the dread of inflammatory symptoms from employing a class of remedies, so well calculated to restore the strength and vigour of the nervous system, essential for carrying on the functions of life. *We must recollect that tone is not excitement, nor strength increased vascular action.*"

The abstraction of caloric from the body, by the application of cold to the surface,—as by COLD BATHING,—has long been ranked amongst tonic agencies—with what propriety the author has considered elsewhere, (*Human Health*, p. 361). The direct effect of such abstraction is certainly sedative; and, therefore, when the vital energies are too strongly exerted, it may, by reducing these, be indirectly tonic; but if it be exhibited, when languor and diminished action pervade the frame; during existing disease; in the state of convalescence; or in feeble infancy, the depressing effects of the application will be rendered manifest. In this respect, the cold and the hot bath are opposed to each other,—the former exerting a sedative, the latter an excitant action. The judgment is often misled by the feeling of glow over the whole surface, which follows immersion in the cold bath, when a healthy individual has recourse to it. This feeling is fallacious: the reaction is not really as great as it appears to be, owing to the mind instinctively contrasting the existing sensation with the one immediately preceding it,—as it does, indeed, on all occasions. If we descend into a cellar in winter, and again in summer, we have, in the former season, the impression of warmth, and, in the latter, that of cold, although the temperature of the cellar may be nearly the same at both seasons,—a comparison being instinctively instituted between the temperature felt, in both cases, immediately previous to the descent; and as, in the one case, the air above was colder, and, in the other, warmer than that of the cellar, the feeling experienced in the room was, in the former case, that of augmented, and in the latter of diminished temperature.

EXERCISE is likewise a tonic, which may be employed with much advantage in disease. When combined with mental amusement—such as travelling exercise affords—its salutary results are sometimes astonishing.

When we regard the effects which active exercise is capable of inducing, and the degree of effort that is necessarily required, we can appreciate the cases in which it may be found advantageous, or the contrary. It is, of course, singularly inappropriate during acute diseases of any kind; and as one of its chief effects is to augment the energy of the circulation, and to cause the blood to circulate through every portion of the capillary system,—if hyperæmia exist in any part of the frame, it may increase it; whilst if obstructions be present to a trifling extent only, the augmented impetus may tend to remove them. But even where *active* exercise is improper, the *passive* form may be adopted; and the change of air and scene, thus afforded, unites with the motion in impressing a salutary influence on a frame debilitated by disease. The author has elsewhere entered into the physiology of the different active and passive exercises, in a hygienic point of view; and has suggested the various remedial and injurious results, that may be induced

by any and by all of them. He will, therefore, confine himself to a few general observations for the guidance of the therapeutical inquirer.

It is in the great class of nervous diseases that we find exercise—especially travelling exercise—so beneficial; and it is surprising what an amount a feeble individual, under such circumstances, is capable of enduring without fatigue. Allusion has already been made to the surprising feats of strength executed by the maniac; and by those whose encephalic functions are inordinately exalted. The resistance exhibited by the valetudinarian, whilst toiling over steep ascents in situations new, but of engrossing interest to him, must be accounted for in a similar manner. This has been forcibly illustrated by Dr. James Johnson. “In the month of August, 1823,” he says, “the heat was excessive at Geneva, and all the way along the defiles of the mountains, till we got to Chamouni, where we were at once among ice and snow, with a fall of forty or more degrees of the thermometer, experienced in the course of a few hours, between midday at Salenche, and evening at the foot of the glaciers in Chamouni. There were upwards of fifty travellers here, many of whom were females and invalids; yet none suffered inconvenience from this rapid atmospheric transition. This was still more remarkable in the journey from Martigny to the great St. Bernard. On our way up through the deep valleys, we had the thermometer at ninety-two degrees of reflected heat for three hours. I never felt it much hotter in the East Indies. At nine o’clock that night, while wandering about the Hospice of St. Bernard, the thermometer fell to six degrees below the freezing point, and we were half frozen in the cheerless apartments of the monastery. There were upwards of forty travellers there—some of them in very delicate health; and yet not a single cold was caught, nor any diminution of the usual symptoms of a good appetite for breakfast next morning.”

This resistance to deranging influences is more striking than strange. It is fortunate, that the condition of the functions, during an elevated temperature, still continues for a time after the temperature becomes depressed. Were it otherwise, the worst consequences might follow an immersion in the cold bath, after the system has been violently excited by the application of heat,—as is the practice with the Russians in their vapour baths; as well as the sudden vicissitudes, to which the climate of the United States is liable. The same disadvantage would apply, although to a less extent, to a change of climate. The excited condition of the capillaries of the surface, induced by excessive heat, subsides gradually when the temperature is suddenly reduced; and in such a manner, that a power of resistance remains for a time; hence it is, that we pass with impunity from a hot room, in the depth of winter, to the external air, the temperature of which may be greatly below the freezing point; and a similar power of endurance continues for some time after a person has quitted a torrid, to reside in a temperate or frigid region,—and conversely.

It is obvious, from what has been said, that the occupation of the mind by a succession of pleasing objects, constituting *amusement*, must be regarded as a tonic influence; and many a valetudinarian, who quits the town during the summer, suffering under dyspepsia, or hypochon-

driasis, or worn down by some corroding or protracted malady, finds his uneasy feelings disappear, and himself almost renovated, before he reaches the end of his journey towards some of the fashionable watering places. A great deal of this effect is owing to simple change of air, so beneficial to the civic resident in a hygienic respect; much, also, to exercise, and to change and appropriate regulation of diet; but the chief part, perhaps, to the mental occupation afforded by varied scenery and society on the way. The whole physical circumstances surrounding the individual are changed; and he abandons himself to new impressions, which break in upon the monotony of the old. "It may be stated, without any risk of being mistaken"—says, recently, an able physician and writer—"that there are very few residents in large towns, particularly in our large manufacturing towns and in London, where such a tour as is described in the following pages, (*A Physician's Holiday, or a Month in Switzerland in the Summer of 1848*, by John Forbes, M. D., F. R. S., London, 1849,) will not benefit in a very marked degree. It will enable a large proportion of such persons to lay in a fresh stock of health sufficient to last through the year, in spite of all the exhausting influences of confined air, sedentary occupations, and that overtaxing of the mind to which so many of them are exposed, and which is the fruitful source of so many diseases. A journey of this kind, properly conducted according to the circumstances of the particular case, will be still more beneficial to that numerous—I had almost said that innumerable—class of invalids who, although unaffected by any fatal or even dangerous disease, are yet so disordered and distressed by chronic functional derangements of various kinds, and by consequent debility, that their condition is much more to be pitied than that of the victims of the severest diseases of an acute kind. To these unhappy persons, whether their malady be in popular or learned phrase, 'bile,' 'liver,' 'stomach,' 'dyspepsy,' 'indigestion,' 'mucous membrane,' 'suppressed gout,' 'dumb gout,' 'nerves,' 'nervousness,' 'hypochondriasis,' 'low spirits,' &c., &c., I will venture to recommend such a tour as that described in this little book—*mutatis mutandis*—as more effectual in restoring health than any course of medicines, taken under the most skilful supervision *at home*. And to say truth, such a journey may be made to fulfil almost every indication of cure applicable to such cases, which, however varied in appearance, are, in reality, extremely similar in their more essential characters.

"A course of travelling of this sort—to speak medically—carried out in the fine season, in one of the healthiest localities of Europe, in a pure and bracing air, under a bright sky, amid some of the most attractive and most impressive scenes in nature, in cheerful company, with a mind freed from the toils and cares of business or the equally oppressive pursuits, or rather no-pursuits, of mere fashionable life—will do all that the best medicines can do in such cases, and much that they can never accomplish.

"It is now well known to all experienced and scientific physicians, that chronic functional diseases of long standing can only be thoroughly cured by such general and comprehensive means as act on the whole system, and for a certain period of time influencing the nutrition in its

source, not merely by the supply of wholesome elements, but by keeping the nutrient function active and vigorous over the entire fabric, by an equable distribution of blood and nervous influence, and consequent energetic action of all the secreting organs. When drugs are useful in such cases, they are so only as subsidiary means, calculated to fulfil some special, local or partial indication. It need, therefore, excite no surprise, that a COURSE OF TRAVELLING, calculated as it is, or at least may be made, to fulfil all the foregoing requisites, should be held forth as one of the most important methods of curing many chronic diseases."

CONFIDENCE and HOPE must likewise be esteemed valuable tonics. The author has previously described the influence exerted by confidence in the physician on the action of his remedial agents,—as well as the great advantage to the patient, in several malignant diseases, that he should not give up hope, 'the sick man's health,' but, on the contrary, should cherish it as one of the most influential agencies in his recovery. It has been properly said by a distinguished poet, himself a physician, that

"whatever cheerful and serene
Supports the mind, supports the body too;
Hence, the most vital movement mortals feel
Is hope; the balm and lifeblood of the soul;
It pleases, and it lasts."

ARMSTRONG.

Every practitioner must have observed the tonic effect of hope, where it has been enthusiastically indulged; and, on the other hand, the blighting results of hope deferred, or lost. It is a common saying, that the physician might as well destroy a patient as tell him there is no hope; and in certain affections this is an approximation to the fact. Where the functions are already greatly depressed, such a communication is likely to add to the depression. Perhaps in no case was the corroding effect of mental anxiety and doubt more exemplified than in the nostalgia, which was so common during the domination of Napoleon; when young conscripts were torn from their families and friends, and forced into foreign and far distant countries;—a disease, which has been said so frequently to affect, also, the Swiss, who have left their homes and their country to dwell in other climes, with little prospect, perhaps, of a return. Rogers has a beautiful allusion to this *Heimweh*, or '*Homeache*,' as well as to the influence of association, in his '*Pleasures of Memory*':—

"The intrepid Swiss, who guards a foreign shore,
Condemn'd to climb his mountain cliffs no more,
If chance he hear the song so sweetly wild,
Which on those cliffs his infant hours beguiled,
Melts at the long lost scenes that round him rise,
And sinks a martyr to repentant sighs."

The effects of mental tonics on the system, especially those of hope and confidence, are well exhibited in the following extract from the work of Dr. A. T. Thomson, to which the author has so often referred.

“Were any thing requisite to prove the power of mental tonics in disease, it would only be necessary to refer to their influence in sustaining the body under fatigue which could not otherwise be borne. What is it but hope and confidence, which enable a mother, night after night, to watch at the bedside of a sick infant? to bear up, even with a weak and delicate frame of body, under fatigues which no stranger could sustain, and yet, if the object of her solicitude recover, to suffer no inconvenience from the exertion:—take away the tonic powers of hope and confidence, or let all her attentions prove unavailing and her infant fall a victim to the malady, then her health will give way, she will feel the exhaustion which naturally follows exertions too powerful for the strength of her body to sustain with impunity, and fall a victim of the anxiety and watching, under which hope and confidence had so long borne her up, and which could alone sustain her by their tonic powers. Nothing can exceed the truth, as well as the beauty of the passage in Milton’s description of the Lazar-house, in which the greatest evil is the absence of hope:—

‘A lazarus-house it seem’d wherein were laid
Numbers of all diseased, all maladies
Of ghastly spasm, or racking torture, qualms
Of heartsick agony, all feverous kinds,
Convulsions, epilepsies, fierce catarrhs,
Intestine stone and ulcer, colic pangs,
Demoniac phrenzy, moping melancholy,
And moonstruck madness, pining atrophy,
Marasmus, and wide-wasting pestilence,
Dropsies, and asthmas, and joint racking rheums.
Dire was the tossing, deep the groans; despair
Tended the sick busiest from couch to couch;
And over them triumphant death his dart
Shook, but delay’d to strike, though oft invoked
With vows, as their chief good and final hope.’

Despair, indeed, in every instance where disease falls upon mortality, may be regarded as bearing the standard in the van of death.”

SPECIAL TONICS.

It has been before remarked, that tonics are given with one of two views,—either to make a decided impression on the nervous system, so as to break in upon a chain of morbid phenomena that supervene in paroxysms,—as in intermittent fever; or to produce a silent but permanent operation for the removal of debility; and, although some of them are capable of acting in both ways, there is convenience in classifying them separately;—into *first*, SIMPLE TONICS; and *secondly*, ANTI-PERIODIC TONICS. The former may admit again of farther subdivision, according to the principles which they contain;—into *first*, such as owe their tonic virtues to bitter principle singly; *secondly*, those that possess,

along with the bitter principle, more or less aromatic property ; *thirdly*, such as have an astringent associated with the bitter principle ; *fourthly*, such as seem to act mechanically ; and *fifthly*, mineral tonics.

I. Simple Tonics.

a. Bitter Tonics

that owe their tonic virtues to bitter principle singly.

1. COLOMBA.—COLUMBO.

This is the root of *Cocculus palmatus* ; SEX. SYST. Diœcia Hexandria ;

Fig. 124.



Cocculus palmatus.

a Male flowers. b Calyx. c Stamen. d Petal. e Bract.

NAT. ORD. Menispermaceæ ; a climbing plant, which inhabits thick forests on the shores of Oibo and Mozambique ; and fifteen or twenty miles inland. It has been cultivated both at Madras and the Isle of France. The roots are dug up in the hot season in March ; the tubers only being generally removed, without injuring the primary root. These are cut into slices and dried on cords in the shade. Columbo is imported largely into England, but the quantity seems to fluctuate greatly in different years. Thus, in 1838, according to Dr. Pereira, duty was paid on 19,805 lbs ; and in 1839, on only 9,384 lbs.

Columbo or Colomba root, as met with in the shops, is in flat, circular or oval pieces, from half an inch to three inches in diameter, and from one to three or four lines thick.

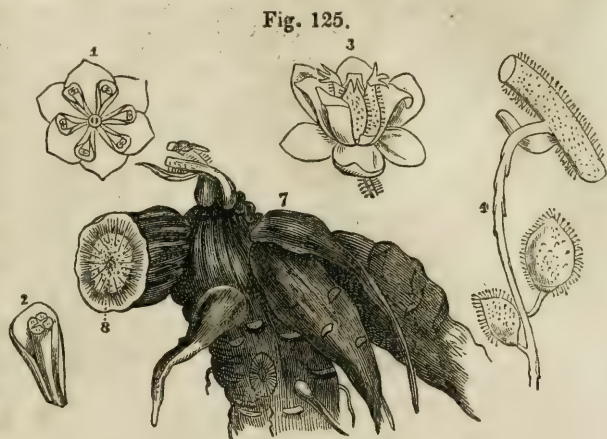
The epidermis is of a yellowish gray or brownish colour ; smooth or irregularly wrinkled. The flat surfaces are of a greenish or grayish yellow colour, depressed in the centre from shrinking during drying, and are frequently marked with concentric circles and lines radiating from the centre.

It readily imparts its principles to alcohol and water. The tonic

principle or *Columbin* is obtained by evaporating an ethereal tincture until crystals are obtained, which are most intensely bitter. The root contains, also, a third of its weight of starch, which renders it an easy prey to insects.

On the continent of Europe, it is said, that the root of *Frasera Walteri* has been sold for Columbo; but they differ so much from each other in appearance that the fraud is readily detected.

Columbo is one of the very best of the bitter tonics; and is greatly used as a stomachic in all cases in which a simple bitter is needed. The best form of preparation is the infusion, but should it be desired to administer it in powder, the dose may be from gr. x to 3ss and more.



Cocculus palmatus.

1, 2, Petals. 3, Ovaries united at the base. 4, Drupes or berries. 5, Single drupe. 6, Transverse section of the same. 7, Spindle-shaped fleshy tubers. 8, Transverse section of the same.

INFUSUM COLOMBÆ, INFUSION OF COLUMBO. (*Colomb. contus.* ʒss; *Aquæ bullient.* Oj.) Boiling water dissolves some of the starch in which columbo abounds; and, hence, the Edinburgh College directs the infusion to be made with cold water, which thoroughly exhausts the root, if used in the way of percolation or displacement; and makes an infusion, that keeps longer without becoming mouldy. The infusion, made in the ordinary way, soon spoils.

It is often given along with alkalies; and forms the excipient, if not the basis, of numerous tonic mixtures. The dose is f.ʒiiss to f.ʒij.

TINCTURA COLOMBÆ, TINCTURE OF COLUMBO. (*Colomb. cont.* ʒiv; *Alcohol. dilut.* Oij; made either by maceration or displacement.) This tincture is a good adjunct to bitter infusions, as to the infusion of columbo; and is, occasionally taken alone, mixed with water. Its dose is from f.ʒj to f.ʒij.

2. GENTIANA.—GENTIAN.

Gentian is the root of *Gentiana lutea*, common or yellow gentian; **SEX. SYST.** Pentandria Digynia; **NAT. ORD.** Gentianacæ. It may be regarded as the best of the simple bitters. Accordingly, it is received into the various pharmacopœias; and its officinal preparations are more numerous than those of any article of the class. The plant is an inhabitant of Alpine grassy slopes and meadows throughout the middle regions of continental Europe; and abounds in the Pyrenees, the mountains of Vosges and Auvergne, and the Alps of Austria and Switzerland, thriving best at an elevation between 3000 and 5000 feet above the sea. It is

said to be particularly abundant on Mount Jura. (Christison.) It is

Fig. 126.



Gentiana lutea.

a beautiful plant, evolving its splendid yellow flowers in July. The root, which is the only officinal part, is brought to this country from Germany. It is said to be imported into England from Havre, Marseilles, &c. In 1839, according to Dr. Pereira, duty was paid on 470 cwt.

As met with in the shops, gentian is in pieces of various sizes; and, if large, is split lengthwise. It is yellowish-brown externally,

and of a brownish-yellow within; and is tough and flexible; but, when thoroughly dried, is readily reduced to a yellowish-brown powder. Its odour is feeble and peculiar; taste at first sweet, but afterwards intensely bitter. It yields its virtues readily to water, alcohol, and wine, which are therefore used as menstrua for certain officinal preparations. When subjected to analysis, it is found to consist mainly of bitter extractive, traces of volatile oil—*oil of gentian*;—gum, an uncrystallizable principle, and gentisic acid or gentisin. MM. Henry and Caventou believed, that they had succeeded in separating, by means of ether, an active neutral crystalline principle of a yellow colour, in which the bitterness of the root was concentrated, and to which they gave the name *Gentianin*; but this has since been shown to be impure gentisic acid; and when the crystals are entirely free from impurities, they are devoid of bitterness. (Leconte, Trommsdorff.) The bitter principle of gentian has not yet been isolated.

Gentian, as already remarked, is one of the bitters most extensively prescribed. It is, indeed, calculated to fulfil all the objects for which the simple bitter tonics are employed. Accordingly, it may be given in atonic dyspepsia, simple or complicated; as well as in convalescence from acute diseases; and in want of tone, howsoever induced. It is an ingredient of the celebrated *Duke of Portland's powder for the Gout*, which consisted of equal quantities of the roots of gentian and birthwort (*Aristolochia rotunda*), the tops and leaves of germander (*Chamædrys*), ground pine (*Chamæpitys*), and lesser centaury (*Chironia centaurium*), powdered, and mixed together. This powder, as well as gentian itself, was at one time thought to possess the power of arresting a paroxysm of gout, and of eradicating the disease; and, as the affection is connected with derangement of the gastro-enteric functions, it may, doubtless, often be serviceable; but it need scarcely be said, that it does not merit the high encomiums that have been passed upon it.

The dried root is sometimes used by the surgeon as a tent to dilate apertures. The powder is occasionally employed to promote the discharge from issues.

INFUSUM GENTIANÆ COMPOSITUM, COMPOUND INFUSION OF GENTIAN. (*Gentian.* cont. \bar{z} ss; *Aurant. corticis* cont., *Coriandr.* cont. $\bar{a}\bar{a}$ \bar{z} j; *Alcohol. dilut.* f. \bar{z} iv; *Aquæ* f. \bar{z} xij.) This is really a weak tincture of gentian, with the addition of certain aromatics, which render it a better stomachic. The alcohol enables the infusion to keep better than if water only were the menstruum. The dose is f. \bar{z} j to f. \bar{z} iss.

TINCTURA GENTIANÆ COMPOSITA, COMPOUND TINCTURE OF GENTIAN. (*Gentian.* cont. \bar{z} j; *Aurant. cort.* \bar{z} j; *Cardamom.* cont. \bar{z} ss. *Alcohol. dilut.* Oij; prepared either by maceration or displacement.) This is an excellent stomachic, which is either added to bitter infusions like the one above; or is taken alone, mixed with water. The aromatics and alcohol cause it to be excitant; and suggest caution in its employment, where there is hyperæmia of the mucous membrane of the stomach. It is apt to be indulged in by hard drinkers, whose gastric functions become impaired; and who, in this manner, without reflection may take considerable quantities of alcohol. The dose of the tincture is f. \bar{z} j or f. \bar{z} ij.

EXTRACTUM GENTIANÆ, EXTRACT OF GENTIAN.—Extract of gentian may be made either by evaporating a decoction of the root, or the cold infusion made by percolation or displacement. The latter is the plan recommended in the Pharmacopœia of the United States. Good gentian yields, by the former method, about half its weight of extract. (Brande.) Extract of gentian may be prescribed alone as a tonic; but it is more frequently used as a vehicle for other tonics, as the preparations of iron. When given alone, the dose is from gr. x. to gr. xxx.

Gentian also forms part of the *Tinctura Rhei et Gentianæ* of the Pharmacopœia of the United States.

3. **GENTIA'NA CHIRAY'ITA**, *Henrice'a Pharmacear'cha*, *Swer'tia chiray-i'ta*, *Agatho'tes Chirayi'ta*, *Chiretta*, *Chirayi'ta*, is a native of India, whence it is imported into England tied up in bundles. It has been long in use there. The herb and root are intensely bitter. They strikingly resemble officinal gentian, and are employed in the same cases either in *infusion*, (*Gent. Chirayit.* \bar{z} ij; *Aq. bullient.* Oss; or in *tincture*, *Gent. Chirayit.* \bar{z} v; *Alcohol. dilut.* Oij. Dose, one or two teaspoonfuls.) The dose of the powder is a scruple.

Other species of gentian—as *Gentiana biloba* or *G. punctata*; *G. purpurea*; *G. macrophylla*; *G. Pannonica*, possess properties analogous to those of *gentiana lutea*; and the roots of some of them are occasionally substituted for it. One other species is officinal in the secondary list of the Pharmacopœia of the United States, the

4. **GENTIA'NA CATESBÆ'I**, *Blue Gentian*. This species of gentian is indigenous in the swamps of the Carolinas, where it flowers from Sep-

tember to December. Its properties resemble those of *Gentiana lutea*; and it may be given in the same cases, dose, and forms of preparation.

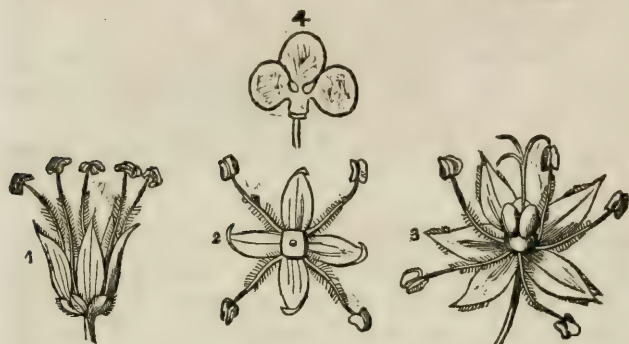
5. QUASSIA.

Quassia wood was at one time obtained from *Quassia amara*; SEX. SYST. Decandria Monogynia; NAT. ORD. Simarubaceæ, a tree, which

Fig. 127.



inhabits Surinam, Guiana, and Colombia; and is cultivated, as an ornamental plant only, in Brazil and the West Indies. Its wood is light, yet close and tough; of a pale yellowish white colour, without smell, and of an intensely bitter taste. It is probable, however, that this—true quassia wood—is never met with in commerce. Dr. Christison states, that he has often tried to obtain it from wholesale dealers in London; but none of the billets sent to him corresponded with true quassia.



Quassia excelsa.

1. Male flower. 2. Flower expanded. 3. Fertile flower. 4. Drupe.

of a different species—*Quassia excelsa* or *Picræna excelsa*, *Lofty Bitterwood Tree*, *Bitter Ash*—a tall beautiful tree, nearly 100 feet in height, which inhabits Jamaica, and other West India islands. The wood is generally in cylindrical billets of various sizes; is very tough; yellowish; without odour, and of an intensely bitter taste, and is kept in the shops either split into small pieces or rasped. It is said to be sometimes adulterated with other woods; but these are detected by their not possessing the intense bitterness of the genuine article. When subjected to analysis it affords traces of volatile oil; a bitter principle termed *quassite* or *quassin*; gummy extractive; pectin; woody fibre, and various salts. The crystalline principle called *quassite*, which was discovered

The quassia now met with in the shops, is the wood

by Wiggers in some of the quassia woods, is not—it has been said—contained in the true quassia, although this last has a large amount of bitter principle. Dr. Christison affirms, that he has not been able to obtain it.

The virtues of quassia are yielded to alcohol and water.

Quassia possesses the medical properties of the simple bitters, and is adapted for all the cases in which the class are indicated; hence, it is largely prescribed, and especially in asthenic conditions of the digestive organs. It is often used in place of hops in the preparation of beer, although prohibited by the statutes of certain countries. It does not, however, communicate any noxious property to the beer; but does not preserve it as well as hops, or make as agreeable a beverage. Like other bitters, it is best given in the form of infusion. It is extremely difficult to reduce it to powder; and the powder—as remarked of simple bitter tonics in general—is an objectionable form in cases of gastric debility. If it be desired, however, to exhibit it, the dose may be ℥j to ℥j, three or four times a day.

INFUSUM QUASSIÆ, INFUSION OF QUASSIA. (*Quassiæ rasur.* ℥ij; *Aquæ Oj.*) Cold water makes a clearer infusion than hot. The dose of the infusion is f.℥iiss to f.℥iij.

TINCTURA QUASSIÆ, TINCTURE OF QUASSIA. (*Quassiæ rasur.* ℥ij; *Alcohol dilut.* Oij; prepared either by maceration or displacement.) Alcohol is said to make a better tincture than the dilute alcohol directed by the pharmacopœias.

This tincture is employed chiefly as an addition to bitter infusions. When given alone, the dose is f.℥j or f.℥ij, in a little water.

EXTRACTUM QUASSIÆ, EXTRACT OF QUASSIA. This preparation is obtained by boiling down the cold infusion, made by displacement, to the proper consistence. Its chief use—like the extract of gentian—is as an excipient for the administration of the mineral tonics. In the dose of five grains, it may be prescribed by itself as a bitter tonic.

6. SIMARUBA.

Simaruba is the bark of *Simaruba officinalis*, *S. amara*, *Quassia simaruba*, *Bitter simaruba*, *Mountain damson*; which is of the same class and order, and the same natural order, as *Quassia amara*. The tree is common in Jamaica, and in other West India Islands; and in Guiana and Cayenne. The bark of the root is the officinal portion. As met with in the shops, it is in pieces of various sizes, which are sometimes very long, and some inches in breadth; folded lengthwise; rough externally; warty, and of a grayish-yellow colour; within, of a yellowish-brown, and on the inner surface of the bark of a pale yellowish-white. It is light and tough; devoid of odour, and of a very bitter taste. When subjected to analysis, it is found to contain a bitter principle analogous to quassite, with a trace of volatile oil, &c. Water and alcohol extract its virtues.

Fig. 128.



Simaruba amara.

1. Female flower. 2. Drupes. 3. Male flower.
4. Stamen.

SEX. SYST. Icosandria Monogynia; **NAT. ORD.** Amygdalaceæ—an indigenous tree, which is common throughout the United States—yields officinal *Wild cherry bark*. On the banks of the Ohio, it is a much larger tree than in the Eastern states.

The inner bark which is the part of *Prunus* employed in medicine—as met with in the shops, is in pieces of various sizes, of a bright cinnamon colour; brittle and readily reducible to a fawn coloured powder. Its taste is agreeably bitter and aromatic, with the flavour of the bitter almond. Its virtues are readily communicated to hot or cold water; but they are impaired, and the flavour injured by decoction, partly in consequence of the volatilization of principles on which they are dependent; and partly of a chemical change effected by the heat. (Wood and Bache.) On distilling the same portion of water successively from several different portions of the bark, a volatile oil, associated with hydrocyanic acid, was obtained by Mr. Procter, of Philadelphia, having properties analogous to those of oil of bitter almonds; and, like it, not pre-existent, but resulting from the reaction of water upon amygdalin.

The medical virtues of *Prunus Virginiana*, are those of a tonic; and, also, of a sedative, owing to the hydrocyanic acid, which is formed;—the tonic virtue being dependent upon the bitter principle, and—it has been suggested—on phloridzin. In this country, it is much prescribed in the debility attending phthisis; in which it has been supposed to act as a sedative on the accompanying hectic; whilst at the same time it impresses a tonic influence on the stomach. It need scarcely be said, however, that but little—even temporary—benefit can be expected from it in such cases, which—when in their confirmed stage—proceed

In large quantities, *simaruba* is said to excite vomiting and purging; but in ordinary medicinal doses, it is a bitter tonic, resembling in its properties the article last described. It has, likewise, been given in dysentery, and the Germans term it *Ruhrrinde*, *dysentery bark*. It can only, however, be serviceable in chronic cases of the disease; and its action is probably altogether that of an ordinary bitter tonic. It is rarely prescribed in this country. The Pharmacopœia of the United States contains no officinal preparation of it. The dose of the powder is from a scruple to a drachm.

7. *PRUNUS VIRGINIANA*.—WILD CHERRY BARK.

Prunus Virginiana, *Cerasus serotina* or *Cerasus Virginiana*;

onward to their fatal termination, unmodified, perhaps, In many of our hospitals, prunus is a routine prescription; the author has carefully watched its effects, he has not that any evident relief was afforded by it. He has certainly witnessed the sedative action that has been ascribed to it. It may be in all cases in which a mild unstimulating tonic is needed.

As in the case of other bitter tonics, the infusion is a better preparation than the powder; but should it be desired to exhibit the latter, the dose may be from $\mathfrak{z}\text{ss}$ to $\mathfrak{z}\text{j}$.

INFUSUM PRUNI VIRGINIANÆ, INFUSION OF WILD CHERRY BARK.—(*Prun. Virginian.* cont. $\mathfrak{z}\text{ss}$; *Aquæ* Oj.) Cold water is used in the preparation of this infusion, to avoid the disengagement of any volatile matter that may be possessed of activity. The dose is $\text{f.}\mathfrak{z}\text{iss}$ — $\text{f.}\mathfrak{z}\text{ij}$, three or four times a day.

Fig. 129.

A SYRUP OF WILD CHERRY, although not officinal, is much used, like other syrups, in bronchitic affections.

8. $\frac{1}{2}$ FRASERA.—AMERICAN COLUMBO.

The root of *Frasera Walteri*, *American Columbo* or *False Columbo*; **SEX. SYST.** Tetrandria Monogynia; **NAT. ORD.** Gentianaceæ, is officinal in the secondary list of the Pharmacopœia of the United States. The plant is one of the most beautiful indigenous productions of the vegetable kingdom; flowering from May to July and flourishing in the southern and western portions of the Union, especially in Arkansas and Missouri. The root, it is advised, should be collected in the autumn of the second, or the spring of the third year; and, before being dried, should be cut into transverse slices. (Wood & Bache.) When dried it is generally in transverse circular segments, about an inch in diameter, and an eighth of an inch or more in thickness. Some years ago, it was introduced into France, and sold for columbo; but if attention



Frasera Walteri.

be paid to the pieces, they will be found to be more uniform in their internal structure ; and not to have the concentric and radiating lines, which are generally seen on columbo. They are of a purer yellow, too ; without a greenish tinge, and contain no starch.

Fraseria has the same properties as columbo and other simple bitters, and is applicable to the same cases. It is not, however, much used. It may be given in infusion ; (*Fraser.* $\mathfrak{z}\text{j}$; *Aquæ bullient.* Oj. Dose ; f. $\mathfrak{z}\text{iss}$ —f. $\mathfrak{z}\text{ij}$;) or in tincture (*Fraser.* $\mathfrak{z}\text{j}$; *Alcohol. dilut.* Oj. Dose f. $\mathfrak{z}\text{j}$ —f. $\mathfrak{z}\text{ij}$,) neither of which is officinal. Should it be desired to give the powder, the dose may be gr. xx to $\mathfrak{z}\text{j}$.

9. SABBAT'IA.—AMERICAN CEN'TAURY.

Sabbatia angularis ; SEX. SYST. Pentandria Monogynia ; NAT. ORD. Gentianaceæ, grows extensively in the Middle and Southern states of the Union, in low grounds especially ; flowering in July and August. The herb is collected whilst in flower. It has a strong bitter taste ; and its virtues are extracted by both alcohol and water.

It may be prescribed in the same cases as gentian ; and, like all the bitters, has been given in the apyrexia of intermittents ; but its powers are not such as to entitle it to be classed amongst the antiperiodic tonics. It is generally given in infusion. (*Sabbatiæ* $\mathfrak{z}\text{j}$; *Aq. bullient.* Oj. Dose, f. $\mathfrak{z}\text{iss}$.) Should it be desired to prescribe it in powder, the dose may be from $\mathfrak{z}\text{ss}$ to $\mathfrak{z}\text{j}$.

10. COPTIS.—GOLD-THREAD.

Gold-thread is the root of *Coptis trifolia* ; SEX. SYST. Polyandria

Fig. 130.



Coptis trifolia.

Polygynia ; NAT. ORD. Ranunculaceæ ; a small indigenous evergreen, resembling the strawberry, which inhabits the northern parts of America ; and is found, likewise, in Asia, Greenland, and Iceland ; flowering in May. The whole of the plant is bitter ; but the root most so. It is, therefore, the officinal portion ; and is admitted into the secondary list of the Pharmacopœia of the United States. As seen in the shops, gold-thread is in loose masses, formed by long filiform, orange yellow roots, frequently mixed with the stems and leaves. The taste is purely bitter,

and, like the other bitters, its virtues are communicated to water and to alcohol. The bitter extractive is precipitated by nitrate of silver, and by acetate of lead.

Gold-thread is a simple bitter, which has been compared to quassia; and may be used in all cases, where the simple bitter tonics are indicated. Like them, it may be given in infusion (*Copt.* ℥j; *Aquæ bullient.* Oj: dose; f.℥iss—f.℥ij); or tincture, (*Copt.* ℥j; *Alcohol. dilut.* Oj: dose; f.℥j—f.℥ij); but neither of these is officinal. Should it be desired to exhibit the powder, the dose may be from gr. x to ℥ss.

Besides the simple bitter tonics already described, the secondary list of the Pharmacopœia of the United States contains the following:

11. ALE'TRIS, STAR-GRASS. The root of *Aletris farinosa*; *Star-grass*, *Blazing Star*, *Mealy Starwort*; SEX. SYST. Hexandria Monogynia; NAT. ORD. Asphodeleæ; an indigenous plant, which is found in almost all parts of the United States; in fields and about the edges of woods; flowering in June and July. Dr. Bigelow states, that he knows of no plant, which surpasses it in genuine, intense and permanent bitterness. The bitterness is owing to bitter extractive; but the root likewise contains resin; for when water is added to the alcoholic tincture, it becomes milky. It may be given as a tonic in infusion or tincture. In large doses, it is said to disturb the stomach.

12. XANTHORRHI'ZA, YELLOW-ROOT. The root of *Xanthorrhiza apifolia* or *X. tinctoria*, SEX. SYST. Pentandria Polygynia; NAT. ORD. Ranunculaceæ—which grows in the Southern and Western States, flowering in April—is so called in consequence of its colour, which, as well as its bitter taste, it yields to water and to alcohol. It is a simple bitter, resembling columbo; and is prescribed in the same cases. It may be given in infusion. (*Xanthorrhiz.* ℥j; *Aquæ bullient.* Oj. Dose; f.℥iss to f.℥ij).

HYDRAS'TIS CANADEN'SIS, *Yellow root*, *Orange root*; an indigenous plant, NAT. ORD. Ranunculaceæ, which is found in most parts of the United States, but is most common to the west of the Alleghanies, and flowers in April and May, possesses the properties of the bitter tonics; but it has not been analyzed. It is best given in infusion. It is said to have been used in this form in the Western States as a wash in ophthalmia; and the Indians employ it as a lotion to chronic ulcers.

b. *Aromatic Bitter Tonics,*

that possess, along with bitter principle, more or less aromatic property.

13. AN'THEMIS.—CHAM'OMILE.

The most important constituents of chamomile flowers—as elsewhere remarked (i. 137)—are volatile oil, and bitter extractive. They contain likewise a little tannic acid. In large doses—as has been seen—the infusion acts as an emetic; in smaller quantities, as an aromatic bitter,—the volatile oil communicating the aromatic or excitant property; the bitter extractive and tannic acid, the tonic. In all cases, consequently, that require the union of an excitant and bitter, as in atonic dyspepsia, an infusion of chamomile is a good prescription; and, accordingly, it is largely used both in professional and popular practice.

Powdered chamomile—for reasons often referred to—is rarely given as a tonic; but should this be considered advisable, the dose may be from gr. x to ʒss, or more. An EXTRACT, prepared from the decoction, is directed in some of the pharmacopœias; but it cannot possess the virtues of an aromatic bitter, in consequence of the volatile oil being driven off during the decoction. It has, consequently, been very properly omitted in the last edition of the Pharmacopœia of the United States (1842),—the extracts of the simple bitters—Gentian and Quassia—possessing all its properties.

14. CASCARIL/LA.

Cascarilla is the bark of *Croton Eleutheria*, and other species of *Croton*; SEX. SYST. Monœcia Monadelphia; NAT. ORD. Euphorbiacæ. *Croton Eleutheria* is a small tree or shrub, which is indigenous in the West Indies, especially in the Bahama Islands, and in Jamaica; from the former of which it is chiefly exported. In the year 1840, duty, according to Dr. Pereira, was paid in England on 14,490 lbs.; but the whole of this was not used in medicine. It is a constituent of most of the fumigating pastilles, on account of the agreeable aromatic odour exhaled by it when burning.

Cascarilla is met with in pieces seldom exceeding from four to six inches in length, which are commonly quilled, but sometimes almost flat; of a gray colour externally, with some portions almost white, and others yellowish-brown; of a brown colour internally, and usually shining. The epidermis is intersected by numerous longitudinal and transverse cracks or fissures. It is compact, hard, and readily reducible to powder. The taste is warm, aromatic, and bitter; and the smell peculiar and agreeable, and increased by heat. Alcohol and water readily extract its medical virtues, which are dependent on a bitter principle, associated with volatile oil. It is, consequently, well adapted for cases which require the aromatic tonics,—as asthenic dyspepsia, and, indeed, debility in general. At one time, it was used as an antiperiodic; but it is now never given with this view.

Should it be desired to prescribe powdered cascarilla, the dose may be from ʒj to ʒss.

INFUSUM CASCARILLÆ, INFUSION OF CASCARILLA. (*Cascarilla* contus. ℥j ; *Aq. bullient.* Oj.) The dose of this infusion—the form in which cascarilla is usually prescribed—is f. ℥iss to f. ℥ij .

15. ANGUSTURA.—ANGUSTURA BARK.

Angustura or *Angostura* or *Cusparia Bark*, is obtained from *Galipea officinalis*; SEX. SYST. Diandria Monogynia; NAT. ORD. Rutaceæ; which is indigenous in the neighborhood of the Orinoco.

MM. Humboldt and Bonpland, however, assert, that *Galipea Cusparia*, *Bonplandia trifoliata*, *Cusparia febrifuga*, yields the bark; and there is reason to believe, that from both trees a bark is obtained much alike in medical virtues. The framers of the last edition of the Pharmacopœia of the United States refer the officinal bark to *Galipea officinalis*. As seen in the shops, the bark is in flat pieces, slightly curved, but rarely entirely quilled; of various sizes; covered by a yellowish-gray, or grayish-white spongy epidermis, which is readily scraped off with the nail; the inner surface is brownish; the transverse fracture short and resinous. The powder is of a pale yellow, somewhat like that of rhubarb. The odour is peculiar, and the taste bitter, acrid, and aromatic. Its medical virtues are imparted to water and to alcohol. The bark has been subjected to analysis, and found to contain a volatile oil, to which it owes its acrid aromatic taste; and a peculiar bitter principle called *Angosturin* and *Cusparin*, to which it is indebted for its tonic properties. At one time a serious fraud was committed on the continent of Europe, by substituting for it the bark of *nux vomica*, which was then termed *false*, *spurious*, or *East India angostura*, before its true character was known. It is now generally admitted by pharmacologists, that it must be referred to *strychnos nux vomica*. The characteristics of the true and the false barks are given in a tabular form by Dr. Pereira.

Angustura bark is a valuable aromatic tonic; but partly in consequence of its liability to adulteration with so poisonous an article as the bark of *strychnos nux vomica*, it has fallen into disuse. Moreover, it was found not to possess the febrifuge or antiperiodic virtues for which it had been extolled; and it is now never used except as an aromatic bitter, in cases in which articles of the class are indicated. In very large doses, it is said to prove emetic and cathartic; but it is never prescribed in this country with any other view than as a tonic, nor is it extensively used in that relation. Should it be desired to administer the powder, the ordinary dose is gr. x to ℥ss ; but the most common and the best form of preparation is the following:—

INFUSUM ANGUSTURÆ, INFUSION OF ANGUSTURA BARK. (*Angustur.* cont. ℥ss ; *Aq. bullient.* Oj.) The dose of this infusion is f. ℥iss to f. ℥ij .

16. SERPENTARIA.—VIRGINIA SNAKEROOT.

Virginia snake-root is the root of *Aristolochia Serpentaria*; SEX.

Syst. Gynandria Hexandria ; NAT.

Fig. 131.



Aristolochia serpentaria.

ORD. Aristolochiaceæ—an herbaceous plant, flowering in May and June, and growing in rich shady woods throughout the Middle, Southern and Western states. It is collected in western Pennsylvania and Virginia ; in Ohio, Indiana and Kentucky ; is usually in bales, containing one hundred pounds ; and is often mixed with the leaves and stems of the plant, and with dirt from which it had not been well freed at the time when it was collected. The roots of *Aristolochia hirsuta*, *A. hastata*, and *A. reticulata*, which scarcely differ from those of *A. serpentaria*, contribute indiscriminately to furnish the snake-root of commerce ; although the last is the only one received as officinal. The root of *aristolochia reticulata* has been introduced of late, and is now not unfrequently used. It is derived from the west of the Mississippi ; and is composed of a knotty caudex, whence arise numerous long fibres, larger than those of the root of *Aristolochia serpentaria*. It has been analyzed by Mr. Thomas S. Wiegand, of Philadelphia, who found

the same constituents as in the officinal root,—the gum, extractive and volatile oil being in a somewhat greater proportion.

Snakeroot, as met with in the shops, consists of the rootstock, whence proceeds a tuft of long, slender, yellowish or brownish fibres. The colour of the powder is grayish ; the smell of the root aromatic and agreeable ; and the taste warm and bitter. It yields its virtues to water and to alcohol. Its main active constituents are volatile oil, the odour and taste of which have been compared to that of valerian and camphor combined,—and bitter principle ; the former being the source of the aromatic and excitant,—the latter that of the tonic properties.

Serpentaria has had great reputation as an excitant tonic ; and, at one time, was employed to arrest intermittents ; but now that we possess more potent agents, it is rarely given except in association with those. It is much prescribed to support the powers in adynamic conditions of the frame. Should it be desired to exhibit it in powder, the dose may be from gr. x to ʒss, and more ; but the following preparations are to be preferred.

INFUSUM SERPENTARIE, INFUSION OF VIRGINIA SNAKEROOT. (*Serpentar.* \mathfrak{z} ss; *Aquæ bullient.* Oj.) The dose is f. \mathfrak{z} iss to f. \mathfrak{z} ij.

TINCTURA SERPENTARIE, TINCTURE OF VIRGINIA SNAKEROOT. (*Serpentar.* contus. \mathfrak{z} ij; *Alcohol. dilut.* Oij; prepared either by maceration or by displacement.) The tincture is rarely prescribed alone; but is added to tonic infusions, especially to the infusion of cinchona. The dose is f. \mathfrak{z} j to f. \mathfrak{z} ij.

Serpentaria forms part of the *Tinctura cinchonæ composita* of the Pharmacopœia of the United States.

17. ABSINTHIUM.—WORMWOOD.

The tops and leaves of *Artemisia absinthium*, common wormwood, are officinal in the Pharmacopœia of the United States. The plant is indigenous in Europe, in the southern part of which it grows abundantly. It is also met with on roadsides and rubbish-heaps in Great Britain; but the druggist is supplied with it from gardens near London. It is raised in the gardens of this country, and has been naturalized in the mountainous regions of New England. The plant is in flower in July or August, at which time the tops and leaves should be gathered. It has a penetrating, peculiar and disagreeable smell, and a very bitter, aromatic taste. It imparts its virtues to water and to alcohol. Its active constituents are volatile oil, which gives it its aromatic character; and bitter principle, on which its tonic virtues are dependent.

Fig. 132.



Artemisia absinthium.

Wormwood is a nauseous bitter, not now much employed, although it is adapted for cases in which the aromatic bitters are indicated. It is more used, perhaps, in atonic dyspepsia than in any other affection. Like all the simple and compound bitters, it was once much given in intermittents.

Infusion is the best form of preparation. (*Absinth.* \mathfrak{z} j; *Aq. bullient.* Oj. Dose; f. \mathfrak{z} iss to f. \mathfrak{z} ij.) The dose of the powder is \mathfrak{z} j to \mathfrak{z} ij.

18. ARTEMISIA VULGARIS.—MUGWORT.

All the species belonging to the genus *Artemisia* possess bitter and aromatic properties. *Artemisia vulgaris*, SEX. SYST. Syngenesia superflua; NAT. ORD. Compositæ Corymbifera, was, like the others, em-

ployed at one time as an aromatic tonic ; but it fell into disrepute, until revived in Germany in modern times as a remedy in epilepsy. It has not, however, been much given as such in other countries of Europe, or in the United States. The root is the part employed, which should be dug up in autumn, after the stalk has become dry ; or in the spring before the stalk has shot up. Burdach recommends many precautions in its preparation. To remove epilepsy, he found it most efficacious, when given in the dose of a tea-spoonful—from fifty to seventy grains—in warm beer ; about half an hour before the paroxysm. Should this be impracticable, it may be administered as soon as the patient can swallow. He must be put to bed immediately ; be covered up warm, and allowed warm small beer to drink, so as to occasion diaphoresis. This plan may be repeated according to circumstances. Burdach has entered into details on this subject, which the author has given elsewhere. (*New Remedies*, 5th edit. p. 94.) In general, it may be sufficient to prescribe a drachm of the powder three times a day, gradually increasing the dose ; or it may be given in infusion or decoction. (*Artemis. vulg. rad. concis.* ʒj ; *Aquæ Oiss* ; boil for half an hour. Dose, half a tea-cupful every two hours in cases of epilepsy.)

It is to be feared that the assertions of the German physicians are too strong, and that the advantages to be derived from the artemisia in epilepsy have been exaggerated. Where there is no organic disease of the encephalon, substances, which, like the artemisia, are nauseous, bitter and aromatic, may be productive of advantage as tonics and revellents ; and the author has seen one or two cases, in which beneficial effects have resulted from its use. It has likewise been given in other diseases, in which aromatic tonics are indicated, but it possesses no virtues over others of the class.

Besides the aromatic bitter tonics, above described, the Pharmacopœia of the United States has the following in its secondary list.

19. ANGELICA.—The root and herb of *Angelica atro-purpurea*, purple angelica or masterwort ; SEX. SYST. Pentandria Digynia ; NAT. ORD. Umbelliferae, a plant which grows between Carolina and Canada, flowering in June and July. The plant has a strong smell, and an acrid and aromatic taste. It is used as an aromatic tonic, like *Angelica Archangelica* or garden angelica, of Europe. Its aromatic powers adapt it for cases of atonic dyspepsia, and flatulent colic. The author has, however, never seen it used. It may be given in infusion (*Angelic.* ʒj ; *Aq. bullient.* Oj. Dose ; f.ʒiiss to f.ʒiiij.)

20. ASARUM,—*Canada snakeroot, wild ginger.* The root of *Asarum Canadense* ; SEX. SYST. Dodecandria Monogynia ; NAT. ORD. Aristolochiaceae ; which grows in old woods and shady places from Canada to Carolina, has an agreeably aromatic taste, considered to be intermediate between that of ginger and that of serpentaria ; qualities, which have given it the names of *wild ginger*, and *snakeroot* in different parts of the country. It has, also, been called *Colt's foot*. The properties seem to

be dependent upon volatile oil, and a bitter resinous matter; both of which are extracted by dilute alcohol.

It resembles serpentaria in its properties; and is sometimes used as a substitute for ginger; so that it might, with propriety, be classed amongst Excitants.

21. CONTRAYERVA.—The root of *Dorstenia Contrayerva*; SEX. SYST. Tetrandria Monogynia; NAT. ORD. Urticaceæ—a native of Mexico, the West Indies, and certain parts of South America—is imported chiefly from the West Indies, and the Brazils. Its odour is aromatic and peculiar; taste warm, bitterish and slightly acrid. Its virtues appear to be dependent upon volatile oil, and bitter extractive.

It is considered to resemble serpentaria; and has been prescribed in the same cases; but it is rarely used in this country, or indeed any where. The dose of the powder is \mathfrak{zj} to \mathfrak{zss} ; but it is best given in infusion (*Contrayerv.* \mathfrak{zj} ; *Aq. bul-lient.* \mathfrak{Oj} . Dose, $\mathfrak{f.3iss.}$)

22. COTULA, MAY-WEED.—The herb *Anthemis Cotula*, May-weed, wild chamomile, which grows abundantly both in the United States and Europe; flowering from the middle of summer till late in the autumn, has properties essentially the same as chamomile; but its smell is so disagreeable, that it is rarely substituted for it. By the physician, it is seldom or never prescribed. The flowers are less disagreeable than the leaves, and may be given in infusion.

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Fig. 133.



Dorstenia contrayerva.

Fig. 134.



Anthemis Cotula.

Fig. 135.



Magnolia Glauca.

Fig. 136.



Magnolia macrophylla.

23. ERYNGIUM, BUTTON SNAKEROOT. The root of *Eryngium aquaticum*, *Button snakeroot* or *water Eryngo*; SEX. SYST. Pentandria Digynia; NAT. ORD. Umbelliferæ, which grows in Virginia and Carolina, flowering in August, has a bitter, aromatic, pungent taste; resembling, apparently, in its action, the ordinary aromatic tonics. In large doses it is said to be emetic. The author knows nothing of its virtues from his own experience; nor is he acquainted with many who do.

24. MAGNOLIA. This is the bark of *Magnolia glauca*, *White Bay*, *Sweet Bay*, *Swamp Sassafras*, *Beaver tree*;—of *M. acuminata*, *Cucumber tree*, and of *M. tripetala*, *Umbrella tree*; SEX. SYST. Polyandria Polygynia; NAT. ORD. Magnoliaceæ; all of which are indigenous in the United States, and admired for the beauty of their foliage, and the size and fragrance of their flowers. The bark of the root is considered to be most active; but that of the trunk and branches is officinal also. It has a bitter, combined with a spicy, pungent taste. Dr. Stephen Procter, in an inaugural essay presented before Jefferson Medical College of Philadelphia, and published in the *American Journal of Pharmacy* for July, 1842, has given as the principal constituents of the bark of *Magnolia Grandiflora*,—green resin, volatile oil, (upon which its remedial virtues, he thinks, depend,) and a peculiar crystallizable principle resembling *liriodendrin*. The aromatic pro-

perty is impaired by drying, and wholly lost when the bark is long kept.

Magnolia macrophylla—a native of the Southern, and some of the Western, States, and remarkable for the magnificence of its leaves and flowers—has similar remedial properties.

Magnolia has been used in intermittents; but it is not so now. It possesses the properties of the class in which it is placed; and may be given as a gently excitant tonic. All its virtues are imparted to dilute alcohol. The infusion is less efficient; but is a good tonic. The dose of the bark, in powder, is from ʒss to ʒj.

25. MARRU'BIUM, HOREHOUND. The herb of *Marrubium vulgare*, *white horehound*; SEX. SYST. Didynamia Gymnospermia; NAT. ORD. Labiatae,—which is indigenous in Great Britain, but grows in most parts of Europe and also in Asia and America; flowering in July,—has a strong aromatic odour and a bitter taste; the bitterness depending upon extractive; and the aromatic properties on volatile oil. Boiling water extracts its virtues; and, hence, it is given in *infusion* (*Marrub.* ʒj; *Aquæ bullient.* Oj. Dose, f.ʒiiss to f.ʒiij) as a tonic; but it has had more reputation as an excitant expectorant and emmenagogue. It enters into the composition of a candy—*horehound candy*—which is much used in catarrh.

26. MATRICA'RIA, *German Chamomile*. This belongs to the same family as *Anthemis* or *Chamomile*; and resembles it in all its properties. The flowers are smaller, less agreeable, and feebler; but it may be prescribed in the same cases.

27. POLYG'ALA RUBEL'LA, *Bitter Polygala*. Both the root and herb of *Polygala Rubella*, *P. Polygama*; SEX. SYST. Diadelphia Octandria; NAT. ORD. Polygaleæ,—which is indigenous in many parts of the United States; flowering in June and July,—are used. It is a strong and permanent bitter; and has been esteemed tonic and excitant; and in large doses diaphoretic, by virtue of its latter operation. It may be given in infusion or tincture.

c. *Astringent Bitter Tonics,*
which have an astringent associated with the bitter principle.

28. GEUM.—WATER AVENS.

This is the root of *Geum rivale*; SEX. SYST. Icosandria Polygynia; NAT. ORD. Rosaceæ; which is indigenous in the United States, and is in the secondary list of the Pharmacopœia. It flourishes in Canada, and in the northern and middle States; sending forth its flowers in June and July.

The root, as met with in the shops, is hard and readily reduced to powder; is of a reddish or purplish colour; devoid of smell; and of an astringent and bitter taste. It has not been subjected to analysis; but, doubtless, contains tannic acid and bitter principle on which its medical virtues are dependent.

Water avens is tonic and astringent, and is, consequently, indicated

in cases where such a joint agency is needed, as in passive hemorrhages, and chronic discharges from mucous membranes. It is, also, used in atonic dyspepsia; and in various adynamic cases. It may be given in the form of infusion or of decoction (*Gei* ℥j; *Aquæ* Oj; dose, f.℥iiss to f.℥ij;) and should it be desired to prescribe the powder, which can never be necessary, the dose may be from ℥j to ℥j. A weak decoction is sometimes taken by valetudinarians in New England as a substitute for tea or coffee.

29. PAULLINIA.

This is an extract from a plant of the same name in Brazil. It is prepared by the Indians. A new alkali has lately been separated from it, which—as well as the extract—is very bitter. Paullinia is prepared from *P. sorbilis*; FAMILY, Sapindaceæ; and its active constituents appear to be tannic acid, and bitter principle.

In Brazil, paullinia is mixed with cocoa, and given as a tisane in diarrhoea and dysentery; and it has been used successfully in France

in asthenic cases,—as in chlorosis, convalescence from severe maladies, &c. According to Martius, an extract is prepared from *Paullinia sorbilis*, which is called there *Guarana*, and is used in similar morbid cases.

Fig. 137.



Hepatica Americana.

The secondary list of the Pharmacopœia of the United States contains the following articles, which may also be referred to this division of simple tonics.

30. HEPATICA, *Liverwort*;—the leaves of *Hepatica Americana*, an indigenous plant. They have no aroma; their taste is mucilaginous, somewhat astringent, and slightly bitter; and they possess no other properties than those of a demulcent tonic, notwithstanding the clamour that prevailed in their favour, in this country, some years ago, as a valuable remedy in chronic bronchitis, hæmoptysis, &c. *Infusion* is the best form of administration. (*Hepatic.* ℥j; *Aq. bullient.* Oj. Dose, f.℥iiss to f.℥ij.)

31. PRINOS, *Black Alder*. This is the bark of *Prinos verticillatus*,

Black Alder; SEX. SYST. Hexandria Monogynia; NAT. ORD. Illicineæ, (Lindley)—Rhamni, (Jussieu); an indigenous shrub, which grows every where in the United States; flowering in June. The dried bark is inodorous; its taste bitter and slightly astringent. It imparts its virtues to boiling water.

Black alder has long been used as a popular remedy in intermittents; and in other affections, as a substitute for cinchona. It is rarely, however, prescribed by the physician. The dose of the powder may be stated at from ʒss to ʒj. It may, also, be given in infusion, (*Prin.* ʒj; *Aquæ bullient.* Oj); decoction and tincture. The berries have similar properties with the bark, and are sometimes made into tincture.

d. *Mechanical Tonics,*

or such as seem to act mechanically.

32. CARBO LIGNI.—CHARCOAL.

It is obtained by burning wood in such manner as to exclude the access of atmospheric air. It is black, devoid of odour and taste, having the texture of the wood from which it has been obtained. It is easily reduced to powder, and is insoluble. When perfectly dry, it absorbs many times its own bulk of certain gases; abstracts from liquids, in which they are dissolved or diffused, different colouring and odorous matters; and hence is used as an antiseptic, and also—although to a less extent than animal charcoal—to deprive liquids of their colours.

Charcoal has been administered occasionally in intermittent fever, and has succeeded,—not probably in consequence of its possessing any intrinsic medical virtues,—for it would seem to have none,—but owing to the impression made on the stomach by the insoluble woody matter. It is, also, used as a tonic in dyspepsia; and, when combined with magnesia, is well adapted for cases in which there is redundant secretion of the gastric acids, and constipation. Probably, as a tonic, its action is mechanical, by the new impression it occasions on the lining membrane of the stomach and intestines, exciting the chylopoietic organs to increased activity. In the same manner it proves cathartic in large doses. In addition to this tonic action,—by virtue of its antiseptic properties it corrects nidorous eructations, and the fetid secretions, often evacuated in diarrhœa and dysentery.

The dose of charcoal is from gr. x to ʒss, or more. Ten to fifteen grains, united with ten of magnesia or carbonate of magnesia, may be given in the cases above mentioned, and be repeated two or three times a day, should the case require it.

33. INDIGUM.—INDIGO.

The well known colouring material *Indigo* is obtained by fermentation from several species of the genus *Indigofera*,—*I. tinctoria*, *I. anil*, *I. disperma*, *I. argentea*, and *I. hirsuta*; SEX. SYST. Diadelphia Decan-

dria ; NAT. ORD. Leguminosæ. During the fermentation, the indigo—which is an educt of the process—is deposited as a feculent matter. It is chiefly brought from the East Indies ; but a considerable quantity is derived from Guatemala and other places. As we receive it, it is generally in small, solid, brittle masses, of a deep azure colour, without smell or taste, and assuming a copper colour on being rubbed.

Fig. 138.



Indigofera tinctoria.

Indigo has been prescribed in various spasmodic diseases, and especially in epilepsy ; and many individuals have deposed to the services it has rendered. Others, however, have not testified so favourably. Trials, made with it at the Philadelphia Hospital, were favourable ; but others were not at all so. The results are detailed in another work. (*New Remedies*, 5th edit. p. 370, Philad. 1846.) It is obvious, however, as there stated, that a wide difference must exist amongst cases of epilepsy ; and that where the organic modifications are considerable, little can be expected from any remedy ; but even in such hopeless cases, the number of paroxysms would seem to have diminished under its use. Where the cerebral affection is slight, and more functional than organic, indigo—like artemisia, and some other remedies extolled in epilepsy—may be useful. It certainly,—from the doses in which it may be administered,—appears to be nearly inert, and perhaps its main efficacy, as the author has said of *Ferri subcarbonas*, consists in the new impression, which it makes, in adequate doses, upon the nerves of the stomach ; and through them upon those of the whole system ; but to effect the revulsion to the necessary extent, it is important that the dose should be augmented day by day ; and the remedy be continued, in large doses, for a sufficient length of time.

It may be begun with in the dose of $\mathfrak{z}\text{j}$; and this may be doubled daily, until the patient takes $\mathfrak{z}\text{ij}$ in the day, which may be continued for weeks. As the powder is very light, it has been proposed to give it in the form of electuary, with simple syrup as the constituent. Some aromatic—as *Pulvis aromaticus*—may be added to it, to prevent it from exciting nausea, which it probably does from quantity only.

e. Mineral Tonics.

FERRI SALES.—SALTS OF IRON.

The effects of the preparations of iron—commonly called *Chalybeates* and *Ferruginous* or *Martial preparations*—are known to all, professional and lay. They are, in proper doses, tonic ; and but few of them are poisonous in any dose. They vary, however, in their precise action on the economy, some possessing, along with a tonic power, decided astringency ; so that they may not be adapted for certain cases in which others of the class may be. In many cases in which they are prescribed—as in the neuroses—their operation seems to place them decidedly

under the class of tonics ; but in others, where great impoverishment of the blood has taken place, as in different forms of anæmia, and in the defective and perverted nutrition thereon dependent, their action would seem to be on the blood itself, and through it on the tissues ; hence they fall properly under the class EUTROPHICS. Such would be their action in cancer. It has been supposed, indeed, that certain cachexiæ are connected with a deficiency of iron in the system, which the use of chalybeates is well adapted to supply.

Of the use of iron as an emmenagogue, the author has spoken elsewhere, (vol. i. p. 413). He has there endeavoured to show, that its operation is altogether indirect ; and that as amenorrhœa is most commonly connected with an asthenic condition of the system in general, and of the uterus in particular, chalybeates become proper remedies.

In certain of the neuroses, they have been found serviceable,—especially in chorea and neuralgia ; and in the latter disease, one of the preparations has been more successful than any other remedy perhaps ; yet in all such cases—indeed in all cases—their use has to be persevered in for a length of time.

Although none of the preparations of iron are now used as antiperiodic tonics, they have been. They are still prescribed in the sequelæ of intermittents, and have exhibited valuable properties in the dispersion of enlargements of the spleen, which are generally, however, easily removed by the sulphate of quinia. M. Cruveilhier affirms, that by the aid of iron he has obtained the resolution of enlargements which have occupied half, or even two-thirds, of the abdomen.

The general properties of the chalybeates adapt them, consequently, for asthenic conditions of various organs, and of the system generally ; and some—it will be seen—are possessed of astringent powers which adapt them for chronic diarrhœa and dysentery. The special cases, however, that require their use, will be readily appreciated by an examination of their individual properties.

34. FERRI SUBCARBONAS.—SUBCARBONATE OF IRON.

This preparation, called also *Sesquioxide of Iron*, *red Oxide of Iron*, and *Carbonate of Iron*, is obtained by mixing solutions of *sulphate of iron* and *carbonate of soda* together ; stirring the mixture, and setting it by, that the precipitate may subside ; which is then washed with hot water and dried.

When the two solutions are mixed together, the sulphuric acid of the sulphate of iron lays hold of the soda of the carbonate of soda, whilst the carbonic acid of the latter lays hold of the oxide of iron of the former. We thus have carbonate of protoxide of iron ; but, in the process of drying, the protoxide attracts oxygen from the air, and carbonic acid is disengaged, so that there ultimately remains sesquioxide of iron, with a trace of carbonic acid.

Subcarbonate of iron is a rust-coloured powder, possessing a decided chalybeate taste. It is sometimes adulterated with brick-dust, which is detected by exposing it to the action of dilute chlorohydric acid. This dissolves the whole of the subcarbonate ; and leaves the impurities.

The subcarbonate is one of the preparations of iron most used, and is adapted for most cases in which chalybeates in general are needed. It was much employed by Mr. Carmichael as a remedy in cancer; but although the cachectic condition has appeared to be occasionally benefited by it, the results have not been encouraging.

In neuralgia, and especially in neuralgia faciei, it was introduced, many years ago, to the notice of the profession, by Dr. Benjamin Hutchinson, who published numerous successful cases of its employment; and, since that time, many testimonials have been adduced in its favour. In the author's hands, in one or two inveterate cases, it has proved signally successful. The novelty of Dr. Hutchinson's plan was to give it in very large doses;— $\mathfrak{z}\text{ij}$, and even $\mathfrak{z}\text{ss}$ and more, in the course of twenty-four hours. Should it disagree with the stomach, an aromatic may be added—for example, five grains of ginger powder, or of *Pulvis aromaticus*, to each dose. If signs of polyæmia or hyperæmia exist, they should be first removed; and, should they supervene on its employment, antiphlogistics may be needed, and the subcarbonate be resumed after their removal. It may, likewise, be necessary to give a brisk cathartic occasionally.

The ordinary dose of subcarbonate of iron, as a tonic, is from gr. v to gr. xx, twice or thrice a day, in honey or molasses.

Subcarbonate of iron is used in the preparation of *Ferri et potassæ tartras*, and *Tinctura ferri chloridi*, of the Pharmacopœia of the United States.

35. FERRI OXIDUM HYDRATUM.—HYDRATED OXIDE OF IRON.

This preparation—called also *Hydrated sesquioxide of Iron*, *Hydrated peroxide of Iron*, *Hydrated tritoxide of Iron*, *Ferrugo*—has been introduced, within the last few years, as an antidote to arsenic. It is prepared by converting common green vitriol, or sulphate of protoxide of iron, into sulphate of the sesquioxide by means of nitric acid, aided by heat. The nitric acid is decomposed; nitric oxide gas is disengaged; and part of the oxygen of the decomposed nitric acid unites with the protoxide of iron to convert it into sesquioxide. As, however, there is too little sulphuric acid in the sulphate of the protoxide to keep the iron in solution when it becomes sesquioxide, sufficient sulphuric acid is added to form the sulphate of the sesquioxide,—namely, half the amount of acid contained in the sulphate of iron employed. Solution of ammonia is then added in excess to decompose the sulphate of the sesquioxide, by uniting with the sulphuric acid of the sulphate. The precipitated sesquioxide is washed with water, until the washings cease to yield a precipitate with chloride of barium; or, in other words, are freed from sulphuric acid; and the sesquioxide is kept in close bottles with water sufficient to cover it.

This oxide is of a reddish or yellowish brown colour; and is much more readily dissolved in dilute acids than the anhydrous sesquioxide. It is wholly soluble in chlorohydric acid without effervescence.

Hydrated oxide of iron is possessed of the same properties as the subcarbonate or anhydrous sesquioxide, and might be given in the same cases. Dr. Christison considers, that it must be preferable from its superior solubility. The evidence in favour of its action as an *antidote to arsenic*, has been given at length elsewhere. (*New Remedies*, 5th edit. p. 314, Philad. 1846.) It would appear to render the poison insoluble, and would seem to be worthy the reliance of the practitioner. It must be administered, however, in very large doses—a table-spoonful every five or ten minutes, or as often as the patient can swallow it. For ordinary cases, as a chalybeate, the dose may be the same as that of the sesquioxide or subcarbonate.

36. FERRI CHLO'RIDUM.—CHLORIDE OF IRON.

The only officinal form, in which the *chloride*, *sesquichloride* or *muriate of iron*, is used is that of

TINCTURA FERRI CHLO'RIDI, TINCTURE OF CHLORIDE OF IRON, *Tincture of Muriate of Iron*, *Solution of Muriate of Iron*. (*Ferri subcarb.* ℥ss; *Acid. muriat.* Oj; *Alcohol.* Oij.) Subcarbonate or sesquioxide of iron dissolves in chlorohydric or muriatic acid with slight effervescence; and the sesquichloride of iron results; so that the tincture is really a tincture of sesquichloride of iron, and is so named in the London Pharmacopœia.

The tincture is of a reddish brown colour; has a sour styptic taste, from excess of muriatic acid; and an odour of chlorohydric ether, which exists in it in small quantity, owing to the action of the chlorohydric acid on the alcohol. This excess of acid is necessary for keeping the protochloride of iron—of which there is a small portion in the tincture—in solution; as the protoxide of the protochloride, when the tincture is exposed to the air, is converted into sesquioxide; and a part is deposited.

Tincture of chloride of iron possesses the general properties of the chalybeates, and is extensively prescribed in asthenic affections. Its virtues as an astringent are referred to elsewhere. The dose is from ℥x to ℥xxx, gradually increased to f.ʒi or f.ʒij, two or three times a day, in water.

The SOLUTION OF PERNITRATE OF IRON possesses analogous properties; but it is almost wholly prescribed as an astringent.

37. FERRUM AMMONIA'TUM.—AMMONIATED IRON.

In the preparation of *Ammoniuuret of Iron*, *Ammoniated Chloride of Iron*, *Ammonio-chloride of Iron*, according to the processes of the Pharmacopœias of London and the United States,—subcarbonate of sesquioxide of iron is dissolved in muriatic acid, by which means a sesquichloride is obtained. A solution of muriate of ammonia, of definite strength, is then added; and the filtered liquor is evaporated to dryness. The residue is rubbed to powder, which appears to consist of the two

chlorohydrates or muriates, as, notwithstanding the nomenclature of the London College, no chemical combination seems to take place between them.

Ammoniated iron is a yellow powder, which is deliquescent, and soluble both in water and alcohol.

The quantity of iron in ferrum ammoniatum is much less than in most of the other preparations of iron, and it is by no means the same in all cases. On this account, although it was at one time used extensively in asthenic cases, and especially in some of the neuroses—as epilepsy and chorea—it is now rarely employed. The dose is from gr. iv to gr. xii, or more, in pill; or in solution. Astringent vegetable substances decompose it.

38. FERRI ET POTASSÆ TARTRAS.—TARTRATE OF IRON AND POTASSA.

Tartrate of Potassa and Iron, Ferro-tartrate of Potassa, Ferric tartrate of Potassa, or Potassiotartrate of Iron, according to the Pharmacopœias of London and the United States, is made by dissolving subcarbonate or sesquioxide of iron in muriatic acid, so as to form a sesquichloride; throwing down the hydrated sesquioxide by caustic potassa; and digesting this in a solution of bitartrate of potassa, so that the excess of acid in the bitartrate may be neutralized by the sesquioxide. This is digested for some time at a moderate heat; and, afterwards, the solution is filtered, and evaporated to dryness.

Tartrate of iron and potassa is an olive-brown powder; and has a ferruginous taste. It is slightly deliquescent,—perhaps from the tartrate of potassa it contains,—and is wholly soluble in water. It is slightly soluble in alcohol. The solution in water is not liable to decomposition for a considerable period.

In commerce, an imperfectly prepared compound is frequently met with, in which none, or only part, of the sesquioxide of iron is in chemical combination with bitartrate of potassa. The following are the characters of the salt, when properly prepared according to the process of the Pharmacopœia of the United States: “Tartrate of iron and potassa is wholly soluble in water. Its solution does not change the colour of litmus; and at common temperatures does not yield a precipitate with potassa, soda, or ammonia. Ferrocyanuret of potassium does not render it blue unless an acid be added.”

Tartrate of potassa and iron has all the virtues of the chalybeates, but in a much milder degree. Its taste is, however, more agreeable, and its solubility ready; so that it affords a pleasant chalybeate in diseases of childhood. The dose is from ten grains to half a drachm.

39. FERRI FERROCYANURETUM.—FERROCYANURET OF IRON, PURE PRUSSIAN BLUE.

Ferrocyanuret of Iron, Ferrocyanate of Iron, Percyanide of Iron, Ferro-sesquicyanide of Iron, Cyanuret of Iron, is prepared on the large

scale for purposes of the arts; and was, therefore, comprised in the materia medica list of the first Pharmacopœia of the United States. In the last revision, however, a preparation is given for a pure article, such as is well adapted for medicinal administration. It is prepared, as an article of commerce, by fusing animal matters with carbonate of potassa, so as to form cyanuret of potassium; and treating the solution of the product with sulphate of alumina and potassa, and sulphate of iron. The greenish precipitate, formed in this manner, acquires, under exposure to the air, a beautiful blue colour. In this state, ferrocyanuret of iron is impure;—containing alumina, sesquioxide of iron, and ferrocyanuret of potassium. To purify it, it is digested in diluted sulphuric acid.

The pure article of the United States Pharmacopœia is formed by the reaction of ferrocyanuret of potassium on sulphate of sesquioxide of iron, washing the precipitate with boiling water, until the washings pass tasteless; then drying the precipitate, and rubbing it into powder.

Pure Prussian blue is of a rich dark blue colour; without smell or taste; and it has been regarded as devoid of action on the animal economy. It is certainly questionable, whether it exert any more influence than indigo. It is insoluble in water and alcohol; and when broken has a bronzed tint, resembling that of indigo, but distinguishable from it by being removed when rubbed with the nail. The test of its purity—as given in the London and United States Pharmacopœias—is, that if it be boiled with dilute chlorohydric acid, and ammonia be added to the filtered liquor, no precipitate is produced. As ordinary Prussian blue contains alumina and sesquioxide of iron, by boiling the article in chlorohydric acid, both substances will be dissolved, and ammonia be thrown down.

Although ferrocyanuret of iron appears to exert no influence on man or animals in health, it has been regarded not only as a simple, but as an antiperiodic tonic. It has, accordingly, been given in atonic conditions in general, especially of the intestinal canal; but, like indigo, it has been more extolled in epilepsy and chorea; and has been prescribed in intermittent fever, on the recommendation of Dr. Zollickoffer, of Maryland, and others. It has likewise been found of service in facial neuralgia; and in some cases of scrophulosis. The author has given it in all these cases, but has not been satisfied with its effects. Dr. Zollickoffer considers it to be especially adapted for intermittents and remit-tents occurring in children, on account of the smallness of the dose required, and its want of taste. The detailed evidences, adduced in its favour, are given in another work, (*New Remedies*, 5th edit. p. 295, Philad. 1846).

It has been used in the form of ointment, (*Ferri Ferrocyanuret. 3j; Ung. cetacei 3j;*) to ill conditioned, torpid, and foul ulcers.

The dose is five grains, three or four times a day, gradually increased.

Ferrocyanuret of iron is used in the preparation of *Hydrargyri Cyanuretum*, of the Pharmacopœia of the United States.

40. FERRI PHOSPHAS.—PHOSPHATE OF IRON.

Phosphate of Iron—which is peculiar to the United States' Pharmacopœia—is formed by the double decomposition of *Sulphate of Iron* and *Phosphate of Soda*: the sulphuric acid of the sulphate of iron lays hold of the soda of the phosphate of soda; and the resulting sulphate of soda remains in solution, whilst the phosphoric acid of the phosphate of soda combines with the protoxide of iron of the sulphate of iron, and forms phosphate of iron, which is precipitated. It is of a slate colour, and is insoluble in water. It possesses the general virtues of the chalybeates; but, like many others of the preparations of iron, does not appear to possess any special virtues to occasion its retention as an official preparation. The dose is from gr. v to gr. x. It is, however, but little used. The cause of its admission into the United States Pharmacopœia is stated to have been “the suggestion of Dr. Hewson, of Philadelphia, who found it, after an extensive experience, to be a valuable chalybeate.” (Wood & Bache.)

41. FERRI SULPHAS.—SULPHATE OF IRON.

Commercial sulphate of iron, commonly called *Green Vitriol* or *Copperas*, is usually prepared on a very extensive scale by exposing iron pyrites to the air for several months; moistening it either by rain or artificially; and so arranging the bed on which the pyrites is placed, that the water may run into a reservoir, whence it can be withdrawn, to be evaporated for obtaining the sulphate of iron formed. Iron pyrites is a native sulphuret of iron; and, by the above treatment, the pyrites attracts oxygen, and becomes converted into sulphate of protoxide of iron. This is too impure, however, for medicinal use; and, accordingly, the London and United States' Pharmacopœias direct it to be made by the action of *dilute sulphuric acid* on *iron wire* or *iron filings*. When thus prepared, the crystals are transparent, and of a bluish-green colour, but on exposure to air, they effloresce, absorb oxygen, and change colour, by the formation of sulphate of sesquioxide of iron. It is very soluble in water, but insoluble in alcohol, and iron does not produce with its solution a precipitate of copper. It has a strong inky, astringent taste, and reddens litmus.

Sulphate of Iron is a powerful chalybeate, possessing, at the same time, astringent properties; and, as will be seen hereafter, employed in many cases on account of these. In very large doses, it acts as an irritant to the stomach and bowels, occasioning nausea, gastrodynia and vomiting; yet it can scarcely be ranked as a poison. As a tonic, it is given in all cases in which chalybeates are indicated. By some, indeed, it is regarded as probably one of the best, as it is the most uniform, of the preparations of iron. The dose is from one to five grains in the form of pill.

Sulphate of Iron enters into the formation of *Ferri Ferrocyanuretum*,

Ferri Oxidum hydratum, Ferri Phosphas, Ferri Subcarbonas, Mistura Ferri Composita, and Pilulæ Ferri Compositæ, of the Pharmacopœia of the United States.

42. FERRI PROTOCARBONAS.—PROTOCARBONATE OF IRON.

When protocarbonate of iron is thrown down from sulphate of iron by carbonate of soda, it readily absorbs oxygen; carbonic acid is given off; and the protocarbonate becomes converted into sesquioxide of iron. It has been long desired, that some mode should be discovered, by which the salt could be maintained in a state of protocarbonate. The addition of sugar was found to effect this object in a great degree, checking the oxidation of the iron, but not wholly preventing it. Accordingly, a preparation has been introduced into the Edinburgh Pharmacopœia under the name *FERRI CARBONAS SACCHARATUM*, in which the precipitated protocarbonate, obtained by the decomposition above mentioned, is triturated with sugar, and dried at a temperature not much exceeding 120° . The powder, thus obtained, is considered to be carbonate of protoxide of iron in an undetermined state of combination with sugar; and sesquioxide of iron. It is of a grayish green colour, and is readily soluble in chlorohydric acid with brisk effervescence.

Protocarbonate of iron has been highly extolled in cases in which the chalybeates in general are indicated. It is readily soluble in acids, and in the fluids of the stomach; and is, therefore, easily absorbed. In the dose of fifteen grains it has produced, in the experience of some, nausea, headache, and a sense of fulness in the head; whilst subcarbonate of iron or sesquioxide is often given in very large quantities, without any such results. The author has not, however, observed these in a single instance. Its dose is from gr. v to 3ss, two or three times a day.

PILULÆ FERRI CARBONATIS, PILLS OF CARBONATE OF IRON, VALLET'S FERRUGINOUS PILLS. These have been introduced into the last edition of the Pharmacopœia of the United States, (1842). They are formed of *sulphate of iron, carbonate of soda, clarified honey, syrup, and boiling water*; the process being essentially that for the formation of protocarbonate of iron,—the mixture, after the addition of honey, being subjected to heat, until it attains a pilular consistence.

These pills have been prescribed in most of the diseases in which chalybeates in general are considered to be indicated; and especially in chlorosis and amenorrhœa. The author has given them freely, but has had no reason for assigning them any pre-eminence over the other preparations of the metal. The objection, urged against the preparation to be next described, is, that the protocarbonate becomes converted into sesquioxide, but it remains to be proved whether the objection have any force. It has, indeed, been unhesitatingly affirmed by M. Blaud, that it has not.

The dose of the pills—weighing three grains each, and therefore con-

taining less than a grain and a half of the protacarbonate—is eight or ten daily.

Mr. Donovan advises that protocarbonate of iron should be prepared in the following manner for extemporaneous use. *Blue sulphate of iron*, in fine powder, ℥ss; *Calcined magnesia* ℥ij; *Water* f.℥vi; *Tincture of quassia* f.℥ij. Divide into six draughts. One to be given night and morning.

MISTURA FERRI COMPOSITA, COMPOUND MIXTURE OF IRON. This mixture was suggested by a preparation, which was long known as *Griffith's Mixture*, from the name of the physician who introduced it into notice; and it still bears the appellation with many. It is composed as follows:—*Myrrh.* ℥j; *Potassæ carbonat.* gr. xxv; *Aquæ rosæ* f.℥viis *Ferri sulph.* in pulv. ℥j; *Sp. lavandul.* f.℥ss; *Sacchar.* ℥j. This mixture, when recently prepared, is a solution of protocarbonate of iron; but when exposed to air, it attracts oxygen; parts with carbonic acid; and deposits sesquioxide of iron. It has been long celebrated as a tonic, and especially in cases of amenorrhœa,—the myrrh and spirit of lavender being added on account of their reputed emmenagogue virtues. It has likewise been largely prescribed in anæmia, chlorosis, and nervous affections in general. It is not easy to see on what grounds it has been so often given in the hectic of phthisis; and in chronic catarrh. In such cases, it certainly possesses no virtues over other admixtures of tonics and excitants.

The ordinary dose of the mixture is f.℥i to f.℥ij, two or three times a day.

PILULÆ FERRI COMPOSITÆ, COMPOUND PILLS OF IRON. (*Myrrh.* pulv. ℥ij; *Sodæ carbonat.*, *Ferri sulph.* āā ℥j; *Syrup.* q. s. Make into 80 pills.) These pills, called also *Griffith's Pills*, resemble the last preparation in the circumstance that the same kind of double decomposition takes place; so that, if it be desired to administer the protocarbonate, they should be prepared extemporaneously, and not kept in the shops. The dose is from two to six pills, two or three times a day.

A medicine, which resembles *Pilulæ Ferri Compositæ*, has lately acquired great celebrity in the south of France. It is called, from its inventor, *Blaud's Pills*. In it, carbonate of potassa, or the bicarbonate, is used instead of carbonate of soda. The objection made to these pills—as in the case of *Mistura Ferri Composita*, and *Pilulæ Ferri Compositæ*—is, that the protocarbonate of iron becomes converted into sesquioxide; but M. Blaud properly asks—“What signifies it to practitioners that my pills contain little or no protoxide of iron, provided they cure chlorosis?” and in testimony that they do so, he adduces a long list of cases in which a cure was obtained in three or four weeks. These pills M. Blaud calls his “*antichlorotic pills*.”

43. FERRI IODIDUM.—IODIDE OF IRON.

Iodide, Protiodide, Ioduret, Hydriodate or Iodohydrate of Iron, is

made by gradually adding *iron filings* to a mixture of *iodine* and *water*. Heat is then applied, through the intervention of which a union takes place between the iodine and the iron, which is denoted by the liquid assuming a greenish colour. By evaporation to dryness, the iodide is obtained; which must be kept in a closely stopped bottle. It is of an iron-gray colour; foliated texture; brittle, and exhibits a crystalline arrangement similar to metallic antimony, except that it is darker. In the dry state, it is devoid of smell; but when moist it exhales an odour of iodine: when dry, it has a strong styptic chalybeate taste; and when moist, an acrid taste precedes the other. It dissolves, in all proportions, in water; making a greenish solution; and, by exposure to air, forms, by the absorption of oxygen, sesquioxide and sesquiodide of iron; the former of which is insoluble; the latter soluble. To prevent these changes a coil of soft iron wire should be kept immersed in it. The iodide is decomposed by heat, with the disengagement of violet vapours, and the production of sesquioxide of iron.

Iodide of iron has been frequently given by the author, in public and in private practice; and he has considered it especially adapted for cases in which there appears to be torpor in the system of nutrition,—as in asthenic dropsy, old visceral engorgements, and indeed, in hypertrophy of any kind, accompanied by deficient action in the intermediate system of vessels. In anæmia or oligæmia, where there is paucity of red globules in the blood; and the fluid is altogether too thin, it would seem to be especially indicated, from the property which it possesses of promoting the coagulation of the blood, and therefore of inspissating it. It appears, indeed, to be the best remedy we possess whenever a eutrophic and tonic is indicated. It has been given with advantage, as a tonic, in chlorosis; in atonic amenorrhœa; atonic dyspepsia; and, indeed, in all cases that are accompanied by debility. In such affections, Dr. A. T. Thomson conceives the iodide to act more efficiently than any of the other preparations of iron. In atonic gastric dyspepsia, the same gentleman found it serviceable, when combined with bicarbonate of potassa, taken at the moment of admixture, in the dose of three to eight grains or more. In chorea, it has been considered by Dr. C. J. B. Williams to answer better than any other chalybeate.

The dose of the iodide is three or four grains two or three times a day. It may be given in the form of *Pills of Iodide of Iron*, which may be prepared in the following manner, after a formula communicated by Mr. Robert Leslie, of Glasgow, to Dr. Christison. Take of *Iodine*, 127 grains; *iron wire*, of about the thickness of a thin quill, half an ounce; *distilled water*, 75 minims. Agitate them briskly together in a strong ounce phial, provided with a well-fitted glass stopper, until the froth, which forms, becomes white. This will happen in less than ten minutes. Pour the liquid upon two drachms of finely powdered *loaf sugar* in a little water, and triturate immediately and briskly for a few minutes; add gradually a mixture of the following powders, viz. *liquorice powder*, half an ounce; *powder of gum arabic*, a drachm and a half; *flour*, one drachm: divide the mass into 144 pills. Each pill will contain about a grain of iodide of iron.

LIQUOR FERRI IODIDI, SOLUTION OF IODIDE OF IRON. The preparation of this name, introduced into the last edition of the Pharmacopœia of the United States, (1842,) is founded on the principle, that to protect the solution of the iodide from decomposition, it is advisable to associate it with sugar or honey; which appears to exert the same protective agency as it does on the protocarbonate of iron. The solution is made after a form proposed by Mr. Procter, of Philadelphia. The first steps of the process, until the liquor assumes a light greenish colour, are the same as for the preparation of Iodide of Iron; honey is then added, and distilled water to make the quantity of solution required.

The dose of the official solution is ten drops, three times a day. The tests of its purity, according to the Pharmacopœia of the United States, are, that it is "of a pale greenish colour; but on the addition of sulphuric acid becomes brown, and emits violet vapours, if heated. It has little or no sediment, and does not communicate a blue colour to starch."

Syrup of iodide of iron, prepared in an analogous manner, is directed in the Edinburgh Pharmacopœia.

44. FERRI LACTAS.—LACTATE OF IRON. †

This preparation has only been introduced of late years into medicine. It is formed by treating pure *iron filings* with *lactic acid* diluted with water. It is in the form of crystalline plates, very white, and changing but little in the air. It is sparingly soluble in water; reddens litmus paper; and possesses the ferruginous taste in a tolerable degree. When dissolved in water, it attracts oxygen, and quickly becomes yellow.

Lactate of iron has been prescribed in cases in which the protocarbonate is employed, and chiefly in chlorosis. MM. Gelis and Conté are, indeed, disposed to refer the beneficial effects of the latter to its becoming lactate of iron in the stomach, by uniting with the lactic acid, which, they think, is one of the gastric acids. This idea led them to administer lactate of iron ready formed. It would seem, however, that in health there is no lactic acid in the stomach. The testimonials in favour of its good effects in chlorosis, and wherever chalybeates are suggested, are numerous. Messrs. Mialhe and Pereira, however, think there is no evidence of its superiority over citrate of iron; and such is the opinion of the author.

45. FERRI CITRAS.—CITRATE OF IRON.

Two citrates of iron were introduced some years ago, by M. Béral—the *citrate of the sesquioxide of iron*, *percitrate of iron*, and the *citrate of the protoxide*, *protocitrate of iron*; the former of which is chiefly used. It is formed by treating *hydrated oxide of iron* with *citric acid* dissolved in water. It is in thin pieces, of a beautiful garnet-red colour; dissolves slowly in cold water, but readily in boiling water, or

in cold when a few drops of liquor ammoniæ are added, which convert it into *ammonio-citrate*.

Citrate of Iron greatly resembles the tartrate and the lactate in its properties. It is an elegant chalybeate; and has been much and satisfactorily prescribed by the author, where chalybeates in general have been indicated. The dose is from five grains to twenty; either in pill or solution.

AMMONIO-CITRATE OF IRON, *Ferric citrate of ammonia* is prepared by neutralizing the excess of acid in preparing the citrate of the sesquioxide by ammonia, and evaporating. It is a much more soluble salt than the citrate of the sesquioxide, and is slightly deliquescent. If the acid of the citrate be neutralized by soda or potassa in place of ammonia, the *sodio-citrate*, or the *potassio-citrate of iron* is formed, which greatly resemble the ammonio-citrate.

In ordinary cases of debility, requiring a chalybeate, especially where the stomach is irritable or where the alkaline carbonates are required to be combined, and in strumous affections of children, the ammonio-citrate is regarded as a valuable preparation.

Its dose is from five to ten grains.

A CITRATE OF IRON AND QUINIA, formed by the union of four parts of *citrate of iron* with one part of *citrate of quinia*, has, also, been introduced by M. Béral; and is given in the form of pill, where a combination of these tonics is indicated.

[46. FERRI FILUM, IRON WIRE; AND FERRI RAMENTA, IRON FILINGS.

Iron wire and Iron filings are used in pharmaceutical preparations. Iron filings are also given internally; in which case, they may act as mechanical tonics—like other insoluble substances; and, like granular tin, may thus prove indirectly anthelmintic. Some change, however, takes place on iron filings in the stomach. They become oxidized by the decomposition of water, and hydrogen escapes, which gives rise to the unpleasant eructations experienced under their use. Like all the preparations of iron, too, they blacken the alvine discharges. When metallic iron is oxidized in the manner mentioned above, a portion of it is doubtless dissolved by the acids, which are almost always present in the stomach.

Iron filings—as obtained from the shop of the blacksmith—are very impure; but they are readily purified by placing a sieve over them, and applying a magnet, so that the filings may be drawn upwards through it. Their dose is from five to twenty grains, in molasses or honey; but they are not often prescribed, as there are preparations of iron, which are far more effective.

Iron wire is used in the preparation of *Ferri Sulphas*; and iron filings in that of *Ferri Iodidum*, and *Liquor Ferri Iodidi* of the Pharmacopœia of the United States.

An *impalpable powder of iron* has been strongly recommended in chlorosis and in different forms of anæmia. It is prepared by passing a stream of *hydrogen* over an *oxide of iron* in a gun-barrel exposed to a red heat. The hydrogen attracts the oxygen, and leaves the metallic iron in a state of extremely minute division. It is the *Fer réduit par l'hydrogène* of the French *pharmaciens*. Owing to its great liability to oxidation, it should be kept in a well-stopped bottle. From ten to thirty grains may be given in the course of the day in honey or molasses.

ZINCI SALES.—SALTS OF ZINC.

The salts of zinc are not extensively employed as tonics.

47. ZINCI OXIDUM.—OXIDE OF ZINC.

Oxide of zinc of most of the pharmacopœias is prepared by decomposing *sulphate of zinc* by means of *carbonate of ammonia*: the sulphuric acid of the sulphate of zinc lays hold of the ammonia of the carbonate of ammonia, forming sulphate of ammonia, which remains dissolved in the distilled water employed; whilst the carbonic acid unites with the oxide of zinc, and forms carbonate of zinc, which is insoluble, and precipitated. The carbonic acid is then driven off by exposing the carbonate to a strong heat. The Dublin College prepares the oxide by burning zinc in atmospheric air. It is a white powder, which is insoluble in water, and devoid of taste and smell, and dissolves in dilute sulphuric and chlorohydric acids without effervescence; whilst if carbonate of lead, or carbonate of lime, be present, effervescence ensues. Ferrocyanuret of potassium and sulphydrate of ammonia throw down white precipitates.

Oxide of zinc has been used as a tonic in various neuroses,—as epilepsy, chorea, neuralgia, gastrodynia, &c., but especially in the first of these diseases. It is now, however, not much employed, although well adapted for cases in which nitrate of silver, or some other of the mineral tonics has been prescribed; and it is necessary to omit them for a time, and substitute another. The dose is from two to five grains two or three times a day, gradually increased.

48. ZINCI SULPHAS.—SULPHATE OF ZINC.

Sulphate of zinc is, at times, used as a tonic in dyspepsia; and is, occasionally, associated with antiperiodics—as cinchona or sulphate of quinia—in the treatment of intermittents. It is more frequently, however, prescribed in the same neuroses as the oxide of zinc, over which it possesses no advantages. Its dose is from one to five grains, in the form of pill,—made with the extract of gentian, for example, as an excipient.

49. ZINCI CHLORIDUM.—CHLORIDE OF ZINC.

Chloride of Zinc or *Butter of Zinc* is readily formed by adding pure

oxide of zinc to any given quantity of pure *muriatic* or *chlorohydric acid*, applying a gentle heat until solution is effected, filtering the solution, and evaporating to dryness; rubbing the resulting chloride to powder, and preserving it in a closely stopped bottle. In the Pharmacopœia of the United States (1842), it is directed to be made by putting metallic zinc in sufficient muriatic acid to dissolve it; then adding a small quantity of nitric acid, and evaporating to dryness; dissolving the dry mass in water; adding chalk to neutralize any acid; filtering; and again evaporating to dryness.

Chloride of zinc is of a whitish colour, deliquescent, and wholly soluble in water, alcohol and ether. It is chiefly used as a caustic; but has been sometimes given internally in the same affections as oxide of zinc. It may be prescribed in the dose of a grain, two or three times a day; or a solution in a spirit of ether may be made. (*Zinci chlorid.* gr. j; *Sp. Æther. sulphuric.* f. 3j;—Dose, five drops every four hours in sugared water, gradually increasing the dose to ten drops or more three or four times a day.)

50. ZINCI CYANURE/TUM.—CYAN/URET OF ZINC; AND

51. ZINCI FERROCYANURE/TUM.—FERROCYAN/URET OF ZINC.

Neither of these preparations is officinal in the Pharmacopœias of Great Britain, or of this country. The *former* is made by the decomposition of *sulphate of zinc* by *cyanuret of potassium*, or *cyanuret of lime*; the *latter* by the mutual decomposition of boiling hot solutions of *sulphate of zinc*, and *ferrocyanuret of potassium*.

They have both been used in the same class of cases as the other preparations of zinc. The dose of the cyanuret is from $\frac{1}{16}$ to $\frac{1}{12}$ th of a grain several times a day, gradually increasing the dose to a quarter of a grain. Of the ferrocyanuret, the dose is from one to four grains.

52. ZINCI ACETAS.—AC/ETATE OF ZINC.

Acetate of zinc is usually formed by the double decomposition of *sulphate of zinc* and *acetate of lead*;—the sulphuric acid of the sulphate of zinc uniting with the lead of the acetate of lead, and forming an insoluble compound; whilst the acetic acid of the acetate unites with the oxide of zinc of the sulphate, and remains dissolved in the distilled water employed. The solution is then evaporated to crystallization. This was the process adopted in former editions of the Pharmacopœia of the United States; but in the last, acetate of lead is dissolved in water; and metallic zinc, granulated, is added to the solution, and shaken with it until the liquid yields no precipitate with iodide of potassium. The solution is then evaporated to crystallization. The crystals are white; have a silky lustre, dissolve readily in water, and are slightly efflorescent. It is devoid of odour, and has a bitter metallic taste.

It is but little prescribed internally, and possesses no advantages

over the other salts of zinc already described. It may be given in the same diseases, in the dose of one or two grains, gradually increasing the quantity. The excipient may be the extract of gentian.

VALE'RIANATE OF ZINC has been extolled by some of the Italian physicians as a remedy in several nervous diseases. It is formed by adding *protoxide of zinc* to the *vegetable acid* to saturation, and then slowly evaporating the solution. A note on the mode of preparing the salt has been published in the *American Journal of Pharmacy*, by Mr. Wm. Procter, Jun., which may be consulted with advantage by the *pharmaceutical*. It is given in the dose of one or two grains in the form of pill. It has been used with marked benefit in neuralgia; and has been prescribed in other neuroses.

53. ARGENTI NITRAS.—NITRATE OF SILVER.

Nitrate of silver,—prepared for the purposes of pharmacy, by dissolving *silver* in *dilute nitric acid*; heating the solution and gradually increasing the heat until the resulting salt is dried; melting this in a crucible; continuing the heat until ebullition ceases, and immediately pouring it into suitable moulds,—is at first white, but becomes dark on exposure to light. It is wholly soluble in distilled water; and the solution yields with chloride of sodium a white precipitate, which is wholly soluble in ammonia.

It has been employed as a tonic in diseases of the nervous system; but chiefly in epilepsy and chorea; and the author is disposed to think, that he has seen more efficacy from it in the former disease than from any other agent. Of course, it can only be serviceable, where there is no serious disease of the nervous centres. There is, however, a striking objection to its use, in the fact, that, when long continued, it has produced a slate colour of the whole cutaneous surface, which has continued for the remainder of existence. In an instance which fell under Dr. Pereira's notice, the patient, a highly respectable gentleman residing in London, was obliged to give up business in consequence of the discoloration, for when he went into the street the boys gathered around him, crying out, "There goes the blue man!" In this instance no perceptible diminution of the colour had occurred for several years; but in some cases it becomes less. In one case, the colour is said to have been diminished by washes of dilute nitric acid. The coloration is rare, for although the author has prescribed the salt largely, and for a long period, he has never witnessed a single case. When it does occur, it would appear to be owing to the nitrate of silver being converted into chloride by the chlorohydric acid of the stomach. The chloride passes into the blood in this state, and is deposited in the corpus papillare. If chloride of silver be moistened, and exposed to the air, it acquires the colour in question.

In explanation of this colour produced in the skin by the nitrate, and supposed by some to depend on the decomposition of the tissue, Professor Krause has stated, that if thin cut layers of epidermis

soaked in a solution of nitrate of silver be exposed to the light, and then made transparent by acetic acid, their texture may be seen to be unaltered; but there are very dark granules from $\frac{1}{1000}$ th to $\frac{1}{1500}$ th of a line in diameter, on the outside of the larger cells, which are, no doubt, chloride of silver and reduced silver, and to these, not to a decomposed tissue, the change of colour is due.

It has been affirmed, that a combination of nitrate of silver with iodine prevents the discoloration; and a formula for the purpose has been prescribed by Dr. Patterson, of Scotland. (R. *Argent. iodic.*, *argent. nitrat.* āā gr. x. Rub into a subtile powder, and add *glycyrrhiz. pulv.* ʒss; *sacchar. ʒi*; *mucilag. acaciæ* q. s. ut fiant pil. xl. Dose,—one, three times a day.) Experience is required to decide whether the iodine possesses the property ascribed to it. As the nitrate may possibly induce the colour, it becomes the physician to state this to the patient, especially if a female, in order that if she consent to take it, she may have no cause of complaint afterwards. There is little or no danger, however, of its occurring under two months use of the article.

In chorea, as well as in another neurosis—angina pectoris—this tonic has proved of service; and it has succeeded in allaying morbid sensibility of the stomach, even when this has arisen from cancer. In such cases, it is of course only a palliative. The dose of the salt, as a tonic, is a quarter of a grain, three times a day, gradually increased to four or five grains. It may be made into a pill with extract of gentian or of dandelion. Crumb of bread has been objected to as an excipient on account of its containing chloride of sodium; but this objection is only plausible, inasmuch as the salt must meet with chlorohydric acid in the stomach.

The disagreeable taste of the nitrate prevents it from being given in solution.

Mr. Lane is of opinion, that when the chloride is conveyed to the cutaneous surface, it is converted into an oxide by the action of light and its strong affinity for albumen; and under the view, that the OXIDE OF SILVER may serve the purposes of the nitrate he has prescribed it as a tonic in half grain doses, twice a day, especially in cardialgia, gastrodynia and irritability of the stomach. It does not seem in any of the cases to have caused discoloration of the skin; but sufficient trials have not been made to determine that it is less likely to induce it than the nitrate.

Sir James Eyre has also highly extolled the oxide, in half grain doses, which, he says, uniformly succeeded in curing pyrosis.

It has been recently affirmed by Dr. Branson, of Sheffield, that when nitrate of silver has been given for some time it produces a blue discoloration of the gums similar to that caused by lead.

CHLORIDE OF SILVER has the same tonic properties as the oxide and nitrate. Its dose is from one to three grains or more, two or three times a day.

54. BISMUTHI SUBNITRAS.—SUBNITRATE OF BISMUTH.

Subnitrate of Bismuth, White Bismuth, Nitrate of Bismuth, Trisnitrate of Bismuth, is prepared by dissolving *bismuth* in *dilute nitric acid*; and pouring the solution into distilled water. The powder that subsides is the subnitrate. In this process, a part of the nitric acid is decomposed, and furnishes oxygen to the bismuth; the oxide of bismuth is then dissolved by the remainder of the nitric acid. On the addition of water to the solution of this nitrate, it is decomposed into subnitrate and supernitrate,—the former, being precipitated, and the latter remaining in solution.

The subnitrate is a white powder, without taste or smell, and very slightly soluble in water. It is blackened by sulpho-hydric acid. Should it contain carbonate of lead or earthy carbonates, it will effervesce on the addition of nitric acid; and if lead be present, sulphuric acid, added to the solution in nitric acid, will throw down a white precipitate.

Subnitrate of bismuth has been employed in various neuroses,—as epilepsy, nervous palpitation, and spasmodic diseases in general. It is most frequently administered, however, in neuropathic affections of the stomach,—as the various forms of cardialgia and gastrodynia, in which it is said to have been found efficacious by many; but it has not answered any very satisfactory purpose in the author's practice. M. Royer has employed it with marked advantage in the diarrhoea of phthisis and typhus; and it has been used in the latter disease in children.

The dose is five grains gradually increased to a scruple or more, two or three times a day, in pill, or in honey or molasses. In large doses it is said to induce considerable gastric and encephalic disorder, like that which is caused by acro-narcotic poisons; yet a recent writer—M. Monneret, of Paris,—affirms, that in much larger doses than are usually given, it is of the greatest value in gastro-enteric affections, especially such as are attended with fluxes. “He has never given less than from two to three drachms a day, nor more than twenty; and has never observed the slightest inconvenience from these large doses; and it is stated to be his custom to give it to the children in his hospital by spoonfuls or table-spoonfuls, without observing more exactitude, so innocuous is it.”

Dr. Pereira seldom commences it in less than a scruple dose, and has repeatedly given half a drachm without the least inconvenience. It is evidently, therefore, not as potent an article, in its action on the economy, as has been generally imagined.

CUPRI SALES.—SALTS OF COPPER.

Three of the salts of copper are prescribed as tonics, and in analogous cases,—the acetate, the sulphate, and ammoniated copper.

55. CUPRI SUBACETAS.—SUBACETATE OF COPPER.

Subacetate of Copper, Ærugo, Verdigris, is an impure subacetate, which is prepared on a large scale in the south of France, by allowing the refuse of grapes, in making wine, to ferment with sour wine, and then placing them between plates of copper. In the course of a fortnight, the plates become covered with subacetate of copper. In Great Britain it is made by interposing, between the plates of copper, cloths steeped in pyroligneous acid. The verdigris used in this country is imported from the south of France.

The appearance of verdigris is well known. It is of a pale bluish green colour; has a disagreeable acetous odour, and a coppery taste. It is insoluble in alcohol; and water resolves it into a soluble acetate, and an insoluble subacetate.

In consequence of its powerful action in an overdose, subacetate of copper is rarely given as a tonic. It may, however, be prescribed in the same cases as the other salts of copper. Its dose, as a tonic, is from one-eighth to a quarter of a grain in pill.

56. CUPRI SULPHAS.—SULPHATE OF COPPER.

Sulphate of copper has been given as a tonic in the same neuroses as the nitrate of silver, and especially in epilepsy and chorea, in which it would appear to have occasionally rendered essential service. It is not as often prescribed, however, as the next article. The dose, as a tonic, is a quarter of a grain three times a day, made into a pill with extract of gentian, or extract of dandelion; and the quantity of the sulphate may be gradually increased to a grain and a half, or two grains, so as not to occasion vomiting.

57. CUPRUM AMMONIATUM.—AMMONIATED COPPER.

Ammoniated Copper, Ammonio-sulphate of Copper, Cupro-sulphate of Ammonia, Ammoniuret of Copper, is made by rubbing together *Sulphate of Copper* and *Carbonate of Ammonia*, until effervescence ceases; the ammoniated copper is then dried, and kept in a well stopped glass bottle,—as, when the salt is exposed to the air, ammonia is given off, and a green powder left, composed of sulphate of ammonia and carbonate of copper. When sulphate of copper and carbonate of ammonia are rubbed together, a reaction takes place between them; they give out a part of their water of crystallization, so that the mass becomes moist; and, at the same time, a part of the carbonic acid of the carbonate of ammonia is evolved, which causes effervescence. The precise theory of the process, and character of the product, are not, however, known; and in the uncertainty the framers of the Pharmacopœia of the United States have given the preparation the name at the head of this article. It is of a deep blue colour; with a strong odour of ammonia, and a styptic metallic taste. When exposed to the air, it loses ammonia,

and becomes of a green colour. It is soluble in water ; but if the solution be much diluted it is decomposed, and subsulphate of copper is thrown down.

Ammoniated copper resembles in its remedial action the sulphate ; and has been given in the same cases, especially in epilepsy, and chorea. In the former disease, it has been highly extolled by many. When taken in too great quantity it produces the same effects as the other salts of copper. The dose is from a quarter to half a grain, two or three times a day, gradually increased to four or five grains and more. It is best given in the form of pill made with crumb of bread, or with the extract of gentian as an excipient.

58. ACIDUM SULPHURICUM.—SULPHURIC ACID.

Sulphuric acid is obtained by burning *sulphur*, united with *nitrate of potassa*, over water in an appropriate chamber. The sulphur, if burnt alone, would yield sulphurous acid ; the nitrate of potassa is added to furnish by its decomposition the oxygen necessary to form sulphuric acid. The precise steps in its preparation, and the theory of the process, belong properly to chemistry. It is always prepared on the large scale by the manufacturing chemists ; and, therefore, is in the *materia medica* list of the Pharmacopœia of the United States, which directs, that it should be of the specific gravity 1.845 ; be colourless ; volatilizable by a strong heat ; and, when diluted with distilled water, be not coloured by sulphohydric acid. Should it be so, it contains sulphate of lead.

Sulphuric acid, properly diluted, is used as a tonic in the same cases as nitric acid. It is often given alone, or associated with bitters, in convalescence from fever, as well as in the course of long protracted fevers. In cases in which there is a deficiency of acid in the stomach, as in what has been called *neutral* or *alkaline indigestion*, it is very often serviceable, and has even been found of more advantage than the muriatic acid ; although the latter is one of the acids secreted by the stomach in health. It is also prescribed in the phosphatic diathesis, in which its tonic agency is, doubtless, of service.

The acid, in its state of concentration, being so highly corrosive, a formula is contained in the pharmacopœias for a diluted acid.

ACIDUM SULPHURICUM DILUTUM, DILUTED SULPHURIC ACID. (*Acid. sulphuric. f. 3j ; Aq. destillat. f. 3xiiij.*) The specific gravity of this acid is 1.09. It may be given in the dose of from ten to thirty drops, three times a day, in a wine-glassful of sweetened water. As the teeth are apt to be injured by the mineral acids, they may be sucked through a glass tube or quill.

ACIDUM SULPHURICUM AROMATICUM, AROMATIC SULPHURIC ACID, *Elixir of Vitriol*. (*Acid. sulphuric. f. 3iiiss ; Zingib. contus. 3j ; Cinnam. cont. 3iiss ; Alcohol. Oij.*) The aromatics and the alcohol render the sulphuric acid more excitant, and greatly more agreeable. Accordingly, it

is far more frequently prescribed as a tonic than the diluted sulphuric acid.

Its dose is from ten to thirty drops, two or three times a day, in a glass of water.

59. ACIDUM NITRICUM.—NITRIC ACID.

Nitric acid is obtained by the action of *sulphuric acid* on *nitrate of potassa*; the sulphuric acid laying hold of the base of the nitrate, and the nitric acid being disengaged, and collected in an appropriate receiver. It is an article, which is always prepared, in this country, by the manufacturing chemist; and, therefore, in the Pharmacopœia of the United States, is placed in the list of the materia medica, with the direction that it must be of the specific gravity 1.5; be colourless; entirely volatilizable by heat; dissolve copper with the disengagement of red vapours—owing to the escape of binoxide of nitrogen; and, when diluted with distilled water, yield no precipitate with nitrate of silver, or chloride of barium;—thus showing, that it contains neither chlorohydric nor sulphuric acid.

When in its state of concentration, this acid is so corrosive as not to be very manageable; a formula is, therefore, given in the pharmacopœias for a diluted acid. It has been much used as a tonic, alone, or associated with bitter infusions, in adynamic fever; and in cases of phosphatic depositions from the urine has been supposed to act beneficially through its tonic powers. Dr. Christison affirms, that the urine has never been rendered acid by it in his hands; so that whatever good it accomplishes must, he thinks, be by some other means than by its rendering the morbid urine acid. He supposes, also, that the benefit ascribed to it in hepatitis may be through its tonic action. It is not much used.

The dose of the strong acid is five to ten minims in a wine-glassful or more of water.

ACIDUM NITRICUM DILUTUM, DILUTED NITRIC ACID. (*Acid. nitric. f. ʒj; Aq. destillat. f. ʒix.*) The dose of this is from forty minims to f. ʒiiss in water. Its specific gravity is 1.08.

In cases in which the British and American practitioners employ sulphuric and nitric acids, the Germans prescribe PHOSPHORIC ACID.

II. Antiperiodic Tonics.

Under this head are comprised tonic agents, which are chiefly employed with the view of preventing those diseases, that are distinguished by marked periodicity. It has been before observed, that most of the tonics already considered have been occasionally employed as antiperiodics in intermittent fever; but, at the present day, they are rarely given as such; whilst those, that have to be described under this head, are almost exclusively relied upon. Again, most of the antiperiodic tonics may be employed in asthenic cases, in which tonics in

general are indicated ; but in this relation they offer, perhaps, no pre-eminence.

60. CINCHONA.—PERUVIAN BARK.

The terms *Cinchona*, *Peruvian Bark*, *Bark*, are employed pharmacologically for the bark of different species of cinchona ; SEX. SYST. Pentandria Monogynia ; NAT. ORD. Rubiaceæ, (Jussieu)—Cinchonaceæ,

Fig. 139.



Cinchona Condaminea.

a. Calyx. b. Ovary and style. c. Corolla. d. Capsule split into two cocci. e. Capsule divided, showing the two cells. f. Seeds in capsule. g. Single seed.

understood even at the present day : until, recently, indeed, the most erroneous views were entertained in regard to it, owing to the jealousy of the Spanish government, who appear to have thrown every obstacle in the way of the inquiring naturalist. Even now, in the London Pharmacopœia, the three varieties, *yellow*, *pale*, and *red bark*, are referred respectively to *Cinchona cordifolia*, *C. lancifolia*, and *C. oblongifolia* ; yet it has been sufficiently shown, that we are still ignorant of the source of the two last varieties, and that the pale barks are derived from different species. Twenty-six species of cinchona are now pointed out by botanists, of which twelve, at least, are thought to furnish a part of the barks that are used. (Lindley.) All the species are either tall shrubs, or large forest trees ; are commonly evergreen, and of great beauty, both in foliage and flower. They inhabit the Andes at various elevations from 11° N. L. to 20° S. L. The best bark is said to be

(Lindley,) obtained from the western coast of South America. Of these, the Pharmacopœia of the United States has admitted three varieties —1. *Cinchona flava*, *Yellow Bark*, the variety known in commerce under the name *Calisaya Bark* ; 2. *Cinchona pallida*, *Pale Bark* ; the variety called in commerce *Loxa Bark* ; and 3. *Cinchona rubra*, *Red Bark*, the variety known in commerce under the latter name. Each of these requires a separate consideration ; but it may be well to premise a few observations, that are applicable to the whole.

Although the botanical history of so interesting a subject as that of the cinchona barks has been attentively studied,

it is by no means

obtained from the trees that grow on a dry rocky soil. The bark peelers or *Cascarillos* commence their operations in May, when the dry season sets in, and end in November. The quantity of bark exported is enormous,—to such an extent, indeed, that scarcity has been apprehended, and under such a feeling, the government of Bolivia, in 1838, issued a proclamation forbidding the collection of bark in its territory for five years.

Cinchona is shipped from various ports of the Pacific,—the most common being Arica, Valparaiso, Lima, Callao, and Payta. The quantity received into England in different years has varied greatly. In 1830, 556,290 lbs. were imported; of which 56,879 lbs. were retained for home consumption. This appears to have been the largest quantity imported in any one year. In 1841, according to Dr. Pereira, 81,736 lbs. paid duty.

The arrangement of the cinchonas, adopted in the Pharmacopœia of the United States, is according to the colour of the barks; for although—as has been correctly remarked—dependence cannot be placed upon this property alone, as barks of a similar colour have been found to possess very different virtues, and between the various colours considered characteristic there is an insensible gradation of shade, still the most valuable barks may be arranged in three groups—the *yellow*, *pale*, and *red*, between which there is, in general, a well-marked distinction.

I. CINCHONA FLAVA, *Yellow Bark*.—Yellow Bark, it has been said, is generally known in commerce under the name *Calisaya Bark*. The London College refers it to *Cinchona cordifolia*, but the precise species that yields it is unascertained. It is produced most abundantly, if not exclusively, in the province of La Paz or its neighborhood in Bolivia, whence it is conveyed to the Pacific and shipped at Arica. Two varieties are met with in commerce, the *quilled* and the *flat*; the former is in pieces, generally from nine to fifteen inches long, from one to two inches in diameter, and from an eighth to a third of an inch in thickness. Some quills are considerably smaller; but such fine quills are not seen in it as form a considerable proportion of the pale barks. The external surface of the quills is marked by longitudinal wrinkles and furrows; and by transverse cracks, which cause the external surface of the bark to be very rough. The colour of the epidermis is of a more or less light gray. This epidermis yields a dark red powder; is tasteless, and possesses none of the virtues of the bark. The outer surface of the bark, where the epidermis is wanting, is of a brown colour.

The *flat calisaya* or *flat yellow bark* possesses the characters of the quilled variety, except that the pieces which are stripped of their epidermis have externally the cinnamon-brown colour of their inner surface, and are free from cracks and wrinkles. They are in pieces either quite flat or but slightly curved. When the epidermis exists, the bark presents the same external appearance as the quilled variety. The inner surface of both varieties is smooth, and of a cinnamon colour. In commerce, the flat variety is divided into the *coated* and the *uncoated*.

Yellow bark resembles in taste and smell the pale variety; but it is stronger. It yields more sulphate of quinia than any other kind of cin-

chona bark, and hence is more largely consumed than any other. In the year 1827, M. Pelletier used 2000 quintals, equal to 200,000 lbs., in the manufacture of 90,000 French ounces of sulphate of quinia, about three drachms of the sulphate to one pound of bark. Chemical analysis would seem to have shown that the flat variety of yellow bark is to be preferred; and it is stated that one French pound of *uncoated* yellow bark yields from 30 to 50 grains more of the sulphate than the coated variety.

II. CINCHONA PALLIDA, *Pale Bark*.—The finest specimen of this is *Crown* or *Loxa Bark*, *Crown Bark of Loxa*, of commerce, which is referred by the London College to *Cinchona lancifolia*. It is *Cinchona corona* of the Edinburgh Pharmacopœia; is the bark of *Cinchona condaminea*, and is collected in the provinces about Loxa. Under the name *Loxa Bark*, however, in the United States, are included all the pale barks. (Wood and Bache.) As met with in the shops, pale bark is in quills, which are in length from six to fifteen inches, single or double, straight or nearly so, and varying in diameter from the size of a crowquill to that of the thumb, or somewhat larger,—and in thickness from one-third of a line to two lines. The epidermis is always on; so that in the case of the pale bark, there are no two varieties,—the coated and the uncoated,—as in the case of the yellow bark. The epidermis has numerous transverse cracks. In the fine quills, these are hardly visible; but longitudinal furrows are observable as well as in the larger quills. The external surface of the epidermis is of a grayish colour; owing chiefly to the lichens that cover it, and sometimes inclining to liver-brown. Gray, or grayish-brown is the predominant tint. The inner surface, and the powder, are of a deep cinnamon brown colour;—the former, in the finer kinds, is smooth; in the coarser, rough occasionally. It has a bitter, aromatic and astringent taste, and a smell somewhat resembling that of tan. The finest quills are most prized; but those of the middle size are considered by Dr. Christison to be really the best.

The pale barks differ from the yellow in containing cinchonina in the place of quinia. In this country they are much less used than they were formerly, the red bark being preferred by many physicians, whilst the yellow, as already shown, is employed for the formation of the sulphate of quinia.

III. CINCHO'NA RUBRA. *Red Bark*.—The botanical origin of this variety of cinchona is unknown. The London and Dublin Colleges refer it to *Cinchona oblongifolia*; but the Edinburgh considers it to be the bark of an unascertained species. Like yellow bark, it is imported in quills, and in flat pieces,—the latter being the more common of the two, and occasionally, very large, as if taken from the trunk of a tree, from two inches to two feet in length, and one to five inches in breadth, and from one quarter to three quarters of an inch in thickness. It is generally coated, or covered with epidermis, which is rough, wrinkled longitudinally, furrowed, and often warty. The colour is reddish brown, with a grayish hue in the hollows, owing to adhering lichens.

The inner surface is of a deep cinnamon brown, inclining to reddish brown; and the colour of the powder is so much redder than that of the preceding varieties as to render the epithet *red bark* appropriate. The taste is bitter, somewhat aromatic, and astringent.

The quilled variety is a species of about the same size as quilled yellow bark. These are of a paler reddish brown externally than the flat pieces, and internally of a clearer cinnamon brown colour, approaching that of yellow bark. On the epidermis are frequent patches of pale gray efflorescence from lichens. The colour of red bark in general is faint reddish brown, and the odour is feebly tan-like. It is distinguished from the varieties already considered by containing both quinia and cinchonia in considerable quantities. This fact ought to cause it to be more largely used; yet in Europe it is so little employed that it receives scarcely any attention. (Pereira.)

Fig. 140.



Cinchona Micrantha.

Such are the varieties of cinchona that are officinal in the Pharmacopœia of the United States. There are many other varieties, however, which are genuine cinchona barks; and yet have not been considered worthy of an officinal position. The Edinburgh Pharmacopœia admits,

indeed, *Cinchona cinerea*, *Gray Bark*, *Silver Bark*, or *Huanuco Bark*, which is obtained around Huanuco, in Peru, and belongs to the class of pale barks. Amongst the genuine, but inferior barks, are the *Carthagena Barks*, which are brought from the northern Atlantic ports of South America: the characters of these, and, indeed, of all the cinchonas, have been well and fully described by Dr. Pereira.

It was to be expected, that so valuable a bark as genuine cinchona should be subject to adulteration. The most important spurious barks are the *Piton* or *St. Lucie Bark*, from *Exostemma floribundum* of the West Indies; the *Caribbean Bark* from *Exostemma Caribæum*, likewise of the West Indies; and the *Pitaya Bark*, also supposed to be the bark of an exostema. They contain neither quinia nor cinchonia. The most common sophistication is in the case of the powder, which may be adulterated with spurious barks or inert matter, and require a very experienced individual to detect the fraud.

The different barks have been classed by Mr. Lindley after their physical characters.

a. *Pale Barks.*

Crown or Loxa	. . .	<i>Cinchona condaminea</i> .
Gray, or Silver, or Huanuco,	. . .	<i>C. micrantha</i> .
Ash, or Jaen,	Unknown.
White Loxa,	Unknown.

b. *Yellow Barks.*

Yellow,	<i>C. lanceolata</i> ; also <i>C. hirsuta</i> , and <i>C. nitida</i> .
Calisaya,	<i>C. lanceolata</i> .
Carthagena,	<i>C. cordifolia</i> .
Cusco,	Unknown.

c. *Red Barks.*

Red bark of Lima,	Unknown.
<i>Cinchona nova</i> ,	<i>C. magnifolia</i> .

d. *Brown Barks.*

Huamalies,	<i>C. purpurea</i> .
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The barks falsely called Cinchonas, which do not yield the cinchona alkaloids, are, according to Drs. Pereira and Royle,

St. Lucie bark,	<i>Exostemma floribundum</i> .
Jamaica bark,	<i>Caribæum</i> .
False Peruvian bark,	<i>Peruvianum</i> .
Brazilian bark (<i>Quina de Pianhy</i>),	<i>Souzanum</i> .
Pitago bark,	<i>Malinea</i> (?) <i>racemosa</i> , &c.

The chemical investigations in regard to Cinchona are extremely interesting; and the results have furnished most valuable aids to therapeutics. It is only, however, within a little more than a quarter of a century, that our knowledge of them has been rendered precise; and chiefly through the labours of two skilful French analytical chemists, MM. Pelletier and Caventou. The following, according to Dr. Pereira, may be regarded as the constituents of the three varieties of genuine barks—*pale*, *yellow* and *red*.

	Pale.	Yellow.	Red.
1. Kinate of cinchonia,	+	+	+
2. ————— quinia,	+	+	+
3. Soluble red colouring matter, (<i>tannin</i> ,)	+	+	+
4. Insoluble do. (<i>red cinchonic</i> ,)	+	+	+
5. Yellow colouring matter,	+	+	+
6. Green fatty matter,	+	+	+
7. Kinate of lime,	+	+	+
8. Starch,	+	+	+
9. Gum,	+	0	0
10. Lignin,	+	+	+

Cinchonia and quinia, the alkalies on which the chief medical virtues of cinchona are dependent, exist in the bark in combination with kinic acid. The quantity yielded by the different varieties varies, and it would appear, that the same variety may yield different quantities, which may account for the discrepancy in the results obtained by different chemists. Thus, Dr. Christison states that an English manufacturer informed him, that 100 pounds avoirdupois of good yellow bark afforded him sometimes 50, sometimes only 25 ounces of sulphate of quinia—that is from 31.25 to 15.6 parts in 1000; or from 23.4 to 11.7 of quinia.

Besides cinchonia and quinia, another alkali has been discovered in Arica or Cusco cinchona, to which the name *Aricina* has been given. It is not, however, of any therapeutical interest. Other alkaloids are, likewise, said to have been found; but their existence is not considered to be established. The tannic acid which gives the astringency to bark, and which is obtained in greatest quantity in the red variety, is doubtless also concerned in its therapeutical action. Cinchonia and quinia, the latter of which is an official preparation, will receive a distinct consideration hereafter.

The active ingredients of cinchona are imparted to water, alcohol and dilute acids; and, accordingly, these menstrua are employed in the formation of different official preparations. Cold water makes an excellent infusion, but does not extract the virtues, unless by the operation of displacement, as well as hot; but the qualities of the different official preparations will require a separate mention.

As an evidence of the value of the discovery of quinia, it may be stated, on the authority of a respectable druggist of this city, (Philadelphia,) that although the best cinchona bark could not be purchased, at the time, for less than a dollar and thirty-seven and a half cents per pound, and in powder for less than one dollar and fifty cents; cinchona powder—so called—could be obtained for ten cents a pound. This consisted of an admixture of false and other barks with cinchona or true barks; and generally, perhaps, not a particle of the latter could be detected in it. Yet the appearance of the true and the spurious powder was so nearly alike, that no difference could be observed even by an experienced eye. From July 1848, to April 1849, inclusive, Dr. Bailey, inspector of drugs at the port of New York, rejected 34,000 lbs. of spurious and worthless cinchona barks, which contained none, or but a trace, of the alkaloids of the true barks; and he affirms, that

the cost of these barks, delivered in that market, was at the time about six cents a pound, whilst the genuine cost eighty cents !

Cinchona has been long celebrated as a tonic and antiperiodic ; and its efficacy in arresting the paroxysms of intermittents has acquired it the name of a *febrifuge*. It is not such in reality ; for it seems to exert no influence over the excited organic actions as they exhibit themselves in ordinary fever. Its great power is in the period of apyrexia ; in which it seems to act upon the nervous system in the same way as other agencies that affect the nerves in a revellent manner ; and thus—as elsewhere remarked of antiperiodic tonics in general—breaks in upon the chain of associated actions, that constitute the disease. But it is not only in intermittent fever that it operates in this beneficial manner. In other diseases, not characterized by any excited condition of the organic actions, it equally destroys the morbid catenation ; and therefore the epithet *antiperiodic* is more appropriate to it than *febrifuge*.

Cinchona is an admirable tonic as well as antiperiodic ; and, as such, is largely employed. Most, however, of its medical virtues are comprised in the salts of its alkaloids—especially the sulphate of quinia, which has, therefore, almost supplanted it. Still, as stated in the general consideration of tonics, there are cases in which sulphate of quinia fails as an antiperiodic ; and in which powdered cinchona succeeds ; partly, perhaps, on account of its containing, along with the alkaloid, an astringent principle ; and partly owing to the lignin or woody matter ; all of which combined may impress the nerves of the stomach more powerfully than sulphate of quinia alone. As a tonic, it may be prescribed in the same cases as tonics in general ; and the same observations as were applied to them, in regard to the best forms for administration, are equally applicable to it. Of these, the cold infusion is to be decidedly preferred. Like tonics in general, apprehension need not be entertained, in doubtful cases, that cinchona may act injuriously as an excitant ; for when it has been administered in the hot stage of intermittents, it has not appeared to add to the excitement.

Before its administration in intermittent fever, it is generally customary to prescribe an emetic of tartrate of antimony and potassa, or of ipecacuanha, or of both combined, and to follow this up by a brisk cathartic ; but in very malignant intermittents, time may scarcely be afforded for the latter. As a general rule, this course appears advisable ; the cinchona usually making a more powerful impression, after the alimentary canal has been cleared of its contents. When it excites nausea, or runs off by the bowels, the addition of an excitant—as of five grains of ginger powder, or of *Pulvis aromaticus*, or a few drops of laudanum, may act as a corrigent. In cases in which it cannot be retained by the stomach, it has been administered in enemata, and in children especially has proved effectual ; three times the quantity that would be given by the mouth being thrown into the rectum. It was formerly, also, the practice to apply it to the surface of the body in the form of cataplasms, pediluvia, bark jackets, &c., but these are never directed at the present day by the physician.

— In a simple case of intermittent, cinchona is generally sufficient to

prevent the paroxysm. Should the disease, however, be complicated with plethora, hyperæmia of any organ, or gastric or intestinal derangement, it becomes necessary to remove these complications, before the remedy can exert its full powers.

Intermittent and remittent fevers are not the only diseases in which, as before remarked, cinchona acts beneficially as an anti-periodic. In all affections that observe anything like a distinct periodical character, and recur at regular intervals, it often exhibits its powers most signally; whilst in those that are very irregular, and where of course it is difficult to anticipate the precise period of attack, little or no reliance can be placed upon it.

The dose of powdered cinchona,—which is the most effectual form, when it is desirable to make a decided impression,—is one drachm, repeated more or less frequently. If half a drachm be given every hour, for eight hours before the anticipated paroxysm, a sufficient quantity may be taken to have a decided antiperiodic effect upon an ordinary ague; and should this not prevent the paroxysm, its repetition in the subsequent interval may wholly arrest the disease. In the generality of cases, indeed, the author has succeeded in preventing the paroxysm by half a drachm given an hour and a half; and repeated an hour, and half an hour before its expected recurrence.

In asthenia, either of the stomach or of the system generally, the watery or alcoholic preparations of cinchona are preferable, but if it be desired to exhibit the cinchona in powder, in these cases, the dose may be from ten to thirty grains.

The taste of cinchona, when mixed with milk, is, according to Dr. A. T. Thomson, completely covered, provided the mixture be taken directly; but if not taken immediately, the medicine soon communicates its taste to the milk.

INFUSUM CINCHONÆ, INFUSION OF PERUVIAN BARK. (*Cinchon. cont. ℥j; Aquæ bullient. Oj.*) This may be prepared by maceration; or an infusion with cold water may be made by displacement or by maceration. Infusion of cinchona contains only a part of the virtues of the drug,—a large portion of the kinates of the active principles remaining in the mass left on the strainer. It is the form generally used when the remedy is given as a tonic. As an antiperiodic, it is not sufficiently potent. The dose is f.℥iiss to f.℥ij three or four times a day.

INFUSUM CINCHONÆ COMPOSITUM, COMPOUND INFUSION OF PERUVIAN BARK. (*Cinchon. pulv. ℥j; Acid. sulphuric. aromat. f.℥j; Aquæ Oj.*) The addition of sulphuric acid decomposes the kinates of the alkaloids, and probably secures the separation of the greater portion of active matter. Its dose is the same as the last.

DECOC'TUM CINCHONÆ, DECOC'TION OF PERUVIAN BARK. (*Cinchon. cont. ℥j; Aquæ Oj.*) If cinchona be boiled for a great length of time, the alkaloids form compounds with other constituents, which are sparingly soluble in hot water, and less so in cold; so that as the decoction cools, they are deposited. This would be prevented by the addition of

aromatic sulphuric acid, as in the last preparation. The decoction contains much more of the active matter of the cinchona than the simple infusion; still, it is rarely used as an antiperiodic. The dose is f.℥ss to f.℥iij.

TINCTURA CINCHO'NÆ, TINCTURE OF PERUVIAN BARK. (*Cinchon. pulv. ℥vj; Alcohol. dilut. Oij*; prepared either by maceration or displacement.) Tincture of cinchona is rarely given alone, on account of the quantity of alcohol that is combined with an ordinary dose. It may however be prescribed in the dose of from f.℥j to f.℥ss in cases of atonic dyspepsia; and where the ordinary bitter tinctures are considered to be indicated. Usually, it is added to tonic infusions or decoctions,—as to *Infusum cinchonæ*, or *Decoctum cinchonæ*; in the proportion of from f.℥j or f.℥ij to f.℥iss of either of these preparations.

TINCTURA CINCHO'NÆ COMPOSITA, COMPOUND TINCTURE OF PERUVIAN BARK. (*Cinchon. pulv. ℥ij; Aurant. corticis contus. ℥iss; Serpentariæ contus. ℥iij; Croci incis., Santal. rasur. āā ℥j; Alcohol. dilut. f.℥xx*; made either by maceration or displacement.) This preparation is commonly sold as *Huxham's Tincture of Bark*. The addition of orange-peel as an excitant, and of Virginia snakeroot as an aromatic bitter tonic, renders this preparation more agreeable and excitant than the simple tincture. It may be given in the same cases. The dose is f.℥j to f.℥ss.

EXTRACTUM CINCHO'NÆ, EXTRACT OF PERUVIAN BARK. This extract, in the Pharmacopœia of the United States, is made by exhausting cinchona by means of alcohol, by the process of displacement, distilling off the alcohol; afterwards treating it with water; mixing the infusions, and evaporating to form an extract. The extract contains most of the principles of cinchona; but it is rarely used. The dose is from gr. x to gr. xxx or more.

QUI'NIA.—QUININE'.

Quinia, *Quina* or *Quinine*—as already remarked—is one of the alkaloïds to which cinchona owes its antiperiodic properties. The mode in which it is obtained will be apparent from considering the process for procuring the sulphate—the only officinal preparation in the Pharmacopœias of Great Britain and the United States. It is generally in the form of powder; has a very bitter taste, and is very sparingly soluble in cold water. It possesses the same virtues as the sulphate; and is, indeed, preferred by some as an antiperiodic. It may be given in the form of pill, in the same dose as the sulphate, or in alcoholic solution.

SULPHATE OF QUI'NIA, Disulphate of Quinia, Subsulphate of Quinia, Sulphate of Quinine, is prepared from yellow bark by the following process. The bark is boiled in water and muriatic acid, by which the kinate of quinia is decomposed, and muriate of quinia is formed; the boiling is repeated on the residuum; the decoctions are mixed; and, whilst hot, lime is added, which unites with the muriatic acid, forming muriate of lime or chloride of calcium: this remains in solution, the

quinia being precipitated. The precipitate is well washed with distilled water, pressed, dried and digested in alcohol, in fresh and fresh portions, until the spirit is no longer rendered bitter. The liquors are then mixed, and an alcoholic solution of quinia obtained. The alcohol is now distilled off. Upon the brown viscid mass remaining, distilled water is poured; and the mixture being heated to the boiling point, as much sulphuric acid is added as is necessary to dissolve the impure alkali. In this way, a sulphate of quinia is formed. Animal charcoal is now added to the hot fluid to deprive the salt of any colouring matter; and after filtering the liquor whilst hot, it is set aside to crystallize. The salt may be rendered still more pure, by dissolving the crystals, thus formed, in boiling water slightly acidulated with sulphuric acid; adding a little animal charcoal; filtering, and setting aside to crystallize. From the mother waters, an additional quantity of sulphate of quinia may be obtained by precipitating the quinia by solution of ammonia; and treating it with water, sulphuric acid, and animal charcoal.

The above is the rationale of the process, recommended in the last edition of the *Pharmacopœia* of the United States.

Sulphate of quinia is in white, filiform, silky crystals, of a snow-white colour, without smell, and of a very bitter taste. It is soluble in 740 parts of cold, and in 30 of boiling water. It dissolves very readily in alcohol; and in water acidulated with sulphuric acid, but is insoluble in sulphuric ether. It gives a blue tinge to water.

The quantity of sulphate of quinia prepared is very great. In the year 1826, in two laboratories of Paris, it amounted to 59,000 ounces. In this country, it was formerly imported altogether from France; but the author is informed, that from 40,000 to 50,000 ounces were made in Philadelphia in the year 1845. It is an expensive article; and is, therefore, liable to adulteration. The chief articles, employed for this purpose, are sulphate of lime, sulphate of baryta, mannite, and starch; by digesting, however, the sulphate in alcohol, the salt is dissolved, whilst the sulphate of lime, the sulphate of baryta, starch and mannite, are left.

Sulphate of quinia possesses almost all the medical virtues of cinchona. It is an excellent tonic, and is the very best of the antiperiodics. Hence, at the present day, no single article is so much employed in the various diseases that are characterized by periodicity.

In impressible individuals, and in others, when given in very large doses, it disorders the gastro-enteric functions; and induces phenomena resembling those caused by narcotic agents,—as restlessness, vertigo, confusion, depravation of vision, tinnitus aurium, and transient deafness. In certain cases, ptyalism would seem to have been induced; the saliva being inodorous, and the teeth firm. When calomel has been given along with it, it has been conceived, that ptyalism has ensued sooner than it might otherwise have done. Like narcotics, too, it is decidedly sedative in large doses.

It has now taken the place of cinchona in all periodical diseases. In intermittents, it is largely employed. In remittents of the pernicious class, it is often necessary to administer it when the subsidence of

symptoms is far from complete. It is one of the best remedies, too, in the engorgements of the spleen and the dropsical effusions, that are the consequences of intermittents; but in such cases, it must be given in very large doses. It is said likewise, to have been found advantageous, in such doses, in the yellow fever of the southern parts of this Union; and a recent writer—Dr. T. D. Mitchell—lays down the untenable position, that all fevers “possess one common property, which, confessedly under the control of the sulphate of quinia in the case of common ague and fever, is not less so in typhoid, typhus, congestive, yellow, and, it may be, all the fevers named in the books;” and he assumes the position, “plainly and boldly,” that “there is but one feature or element in either of the fevers named that is essential to its pathology, and that feature or property or element bows before the potent sway of the sulphate of quinia, and for this reason only we cure the patient!”

It is scarcely necessary to say that quinia and its preparations are not universally applicable. In remittents and intermittents, that are accompanied by hyperæmia of internal organs, such hyperæmia must be removed before quinia or its salts can exert their efficacy; and there is truth in the remark of Professor Dickson—that “they deceive themselves who regard quinia as a universal and infallible febrifuge, even in malarious fevers.”

Besides its antiperiodic virtues, it possesses—as already remarked—those of a tonic. There are many, however, who esteem cinchona to be preferable, as a tonic, to quinia; and who administer the latter to prevent the paroxysms of an intermittent; but prescribe the former, when they are desirous of strengthening the system and preventing a relapse.

As an antiperiodic, it may be given in the quantity of from four to ten grains in the twenty-four hours. The author is in the habit, in cases of regular intermittents, of prescribing five grains, dissolved in water, about an hour before the expected paroxysm, and repeating it in the course of half or three quarters of an hour; and, should there be evidences of the return of the paroxysm notwithstanding, he prescribes fifty drops of laudanum. Under the joint action of the tonic and the narcotic, the paroxysm will generally be prevented, or be so far broken as to yield to a repetition of the treatment before the next expected paroxysm. It has, however, been given in much larger quantity than this, sometimes to the extent of thirty grains or more every hour, until upwards of ninety grains and more have been taken; but it is questionable whether such large doses can be necessary. In the cases of yellow fever, before referred to, from a scruple to a drachm was given for a dose with signal success.

Like cinchona, sulphate of quinia has been given largely in acute rheumatism—a disease, which is peculiar,—and, in the author’s opinion, largely neuropathic. Some years ago, M. Briquet announced, that he had cured acute articular rheumatism, accompanied with violent pain, swelling, redness, fever, &c., in two or three days, with sulphate of quinia, in doses of about a drachm and a half daily. Such doses, however, cannot always be given with impunity; and whilst they were in vogue in Paris, they proved fatal—it is affirmed—in several cases. The author has often prescribed it in doses of from 20 to 30 grains in

the 24 hours with decided advantage. Its febrifuge virtues are marked ; and instead of its acting as an excitant, the effects are those of sedation. This has been signally shown by some recent experiments of M. Brecquet, of Paris. In doses of fifteen grains and upwards, the pulse was reduced from eight to forty beats in the minute.

It has been given to a great amount in this country. A medical friend of Dr. Dickson assured him, that in Alabama he had administered "thirty grains of a solution of sulphate of quinia every hour for seventeen successive hours," and he states farther that he heard authentically of a western physician, "who emptied into the stomach of a patient labouring under bilious remittent an ounce bottle in one night." Dr. B. Rush Mitchell, in a case of congestive fever, gave thirty grains every half hour until two hundred and forty grains were taken in about four hours ; and the patient recovered. Twelve grains are considered to be equivalent to about an ounce of good bark.

Solution is a more disagreeable form of administration than pill ; but as it is important that the new nervous impression should be as forcible and extensive as possible, it must obviously be advantageous, that the gustatory nerves should be impressed as well as those of the stomach. The recent experiments of M. Brecquet satisfied him, that the solution is more active by one-half. The taste, left by it, is soon annihilated by chewing a piece of apple.

Like cinchona, it may be administered *per anum*, and it has the advantage, which cinchona has not, of being capable of employment endermically, when the condition of the stomach forbids its use by the mouth. Three times the ordinary dose may be added to a common enema ; and when it is to be exhibited endermically, from four to eight grains may be sprinkled on the surface denuded by a blister. As much as two drachms has been applied in this manner. An ointment, composed of $\mathfrak{z}\text{j}$ of *sulphate of quinia*, and $\mathfrak{z}\text{ij}$ of *lard*, has been rubbed into the axilla, with success, in cases of ague in children ; and it has been affirmed by M. Ducros, that doses of about three quarters of a grain, dissolved in ether and rubbed on the lining membrane of the mouth, cause a stronger and more rapid action than half a drachm given by the stomach.

PILULÆ QUININÆ SULPHATIS, PILLS OF SULPHATE OF QUINIA. (*Quinia sulph.* $\mathfrak{z}\text{j}$; *Acaciæ pulv.* $\mathfrak{z}\text{ij}$; *Syrup. q. s.* to make 480 pills.) Each pill contains a grain of sulphate of quinia.

Besides the sulphate, other salts of quinia have been prescribed. AC'ETATE OF QUINIA acts like the sulphate, but deserves no preference ; and the same may be said of CITRATE OF QUINIA, MU'RIATE OF QUINIA, and NITRATE OF QUINIA. FERROCY'ANATE OF QUINIA is considered by some to possess antiperiodic properties, superior even to those of the sulphate, yet it is but little used ; and TANNATES OF QUINIA and CINCHO'NIA have been regarded as the most active of the combinations of the alkaloids. None of these are used on this side of the Atlantic. For a farther description of them,—as well as of an *impure sulphate of quinia*, called in a former edition of the Pharmacopœia of the United

States, *QUINÆ SULPHAS IMPURUS*, formed by evaporating the liquor poured off the crystals of sulphate of quinia to the consistence of a pilular mass, and which has been known, for years, in Philadelphia, under the name of *Extract of Quinine*—the reader is referred to another work, (*New Remedies*, 5th edit. p. 549, Philad. 1846).

CINCHO'NIA, and *SULPHATE OF CINCHO'NIA*, are obtained from pale bark, by a process similar to that by which quinia and sulphate of quinia are obtained from yellow bark. It would appear that sulphate of cinchonia is equally effective as an ordinary and antiperiodic tonic with sulphate of quinia,—a fact which, as Dr. Pereira observes, acquires some importance from the apprehended failure of yellow bark, in which quinia abounds.

VALE'RIANATE OF QUINIA has been lately introduced by M. Devay as superior to sulphate of quinia. The following is his mode of preparing it. To a concentrated alcoholic solution of quinia, valerianic acid in slight excess is added: the solution is diluted with twice its volume of distilled water; and the whole is well stirred, and then placed in a sand-bath, the heat of which does not exceed 145° Fah. When the alcohol is evaporated, valerianate of quinia presents itself in beautiful crystals, which increase from day to day.

As the salt is readily decomposable, M. Devay gives it in the most simple form, generally in a solution of gum arabic. The dose is from 1½ to 6 grains during the apyrexia.

I'ODIDES OF QUI'NIA AND CINCHO'NIA, described under *EUTROPHICS*, may be useful additions to the *Materia Medica*,—formed as they are by the combination of a valuable eutrophic and a tonic; but their medicinal properties have not yet been fully tested.

61. *AC'IDUM ARSENIOSUM*.—*ARSE'NIOUS ACID*.

Arsenious Acid, *White Arsenic*, *White Oxide of Arsenic*, occurs in nature, either tolerably pure, or combined with other metals or metallic oxides. White arsenic of the shops is understood, however, to be obtained from the refuse found in the flues of furnaces where other metallic ores undergo the process of roasting; and more especially from the refuse of the roasting of the arseniuret of cobalt. The impure material from the flues is subjected to a second sublimation; which renders it sufficiently pure for medicinal purposes. It is prepared in Silesia, Bohemia, Saxony and Cornwall; and the precise processes adopted in each of these places are described at some length by Dr. Pereira. From Penryn, in the last place, not less than 600 or 800 tons are shipped annually. That which is used in this country comes chiefly from Hamburg and Bremen. (Wood & Bache.)

Recently sublimed arsenious acid is in masses, which are convex on one side, and concave on the other; taking the shape of the vessel used in the sublimation. The cakes are transparent, and of a vitreous appearance; but they soon become opaque and white externally, the

opacity gradually extending from the circumference to the centre. It is entirely volatilized by heat; emits an alliaceous odour when thrown on ignited charcoal, and is completely dissolved by boiling water. It has little or no taste, and is devoid of smell; but if left for some time in contact with the lining membrane of the mouth or nostrils, it causes considerable irritation. Boiling water dissolves about one-ninth of its weight, and on cooling to 60° retains 1-35th. Temperate water takes up scarcely 1-400th of its weight. (Christison.) The presence of organic matters very much impairs the solvent powers of water in regard to it, which accounts for arsenious acid not having been found in the liquid contents of the stomachs of those who have been poisoned by it. (Pereira.) The adulterations of arsenic are unimportant.

In large doses, arsenious acid is a virulent irritant poison, and is known as such in almost all parts of the world. Yet it is stated as a fact by Dr. Blake, now of Saint Louis, that arsenic, which, it might have been presumed, would be rapidly fatal, "is so inert when introduced into the blood, that it will not speedily produce death, unless it is injected in quantities sufficient to directly coagulate the blood." "It remains"—he adds—"for future experiments to determine if this is owing to its being isomorphous to one of the elements of the fluids and solids, the phosphorous." (See vol. i., p. 94.)

In small doses, and administered for a considerable period, arsenious acid modifies the condition of the fluid of the circulation, and, through it, of the system of nutrition, so as to remove various morbid conditions of the same. Hence, it falls also under another head—that of EUTROPHICS. It is generally likewise regarded as a tonic, and all admit that it is an antiperiodic. Under continued use, a sensation of heat in the throat, œsophagus and stomach, is, at times, experienced, with nausea, pain of the stomach, and occasional vomiting: great languor or depression of spirits is likewise felt, with redness of the eyes, swelling of the eyelids, and œdema of the face:—to the last symptoms the name *Edema Arsenicalis* has been given. The practitioner ought to be on the watch for their supervention, as they are the first evidences of poisoning; and the remedy should be discontinued, until they have passed away. Arsenic was probably one of the agents employed in the cases of slow poisoning, that have been recorded in the annals of turpitude and crime.

As an antiperiodic, it has been employed in intermittents; and with much success. This property has been long known, and is still greatly prized. It succeeds, at times, when both sulphate of quinia and cinchona have failed, although it is not perhaps so well adapted for the generality of cases as either; and even were it so, the evils that occasionally result from its use would render either of the others preferable. It has, however, its advantages; and a modern writer, Dr. Brown, who prescribed it in many hundred cases, considers it superior to cinchona, but inferior to sulphate of quinia. It is devoid of taste, which is an advantage; and if any apprehension be entertained in regard to the exhibition of the bark, or its alkaloid, during the hot stage of an intermittent, it cannot apply to arsenious acid. At times, too, the acid, in

combination with other antiperiodics, is successful, when neither, singly, has arrested the disease.

Like sulphate of quinia, arsenious acid has exhibited its powers in other diseases characterized by regular periodicity, as in hemicrania, and various other forms of neuralgia. In epilepsy, it has not been as efficacious as some of the metallic tonics already considered; but in chorea, in the practice of some, its beneficial agency has been signal.

The dose in substance is from one-sixteenth to one-eighth of a grain in the form of pill. Care must, of course, be taken that the arsenic is well divided. With this view, one grain may be rubbed with a little sugar, and then sufficient crumb of bread be added; the whole being well beaten before the division into sixteen or eighteen pills. Most commonly, it is administered in the form of *Fowler's solution*,—the preparation given below. Some, however, have believed, that they cannot be substituted for each other. As arsenious acid is apt to accumulate in the system, it may be well to intermit its use for a day or two every fortnight, or three weeks at the farthest; and, to avoid unpleasant gastric symptoms, it has been advised that it should be taken when food is in the stomach; but it is questionable, whether there be much advantage in this. Dr. Christison thinks, that dilution is a more rational way of preventing any unpleasant immediate action.

LIQUOR POTASSÆ ARSENITIS, SOLUTION OF ARSENITE OF POTASSA.—This is prepared by boiling *arsenious acid* and *carbonate of potassa* in *distilled water*, until the acid is wholly dissolved. To the solution, when cold, a little *spirit of lavender* is added to give it colour and flavour, by which it may be distinguished from water. The preparation was first proposed by Dr. Fowler, and hence was called after him *Fowler's solution*. It also long bore the name of *Tasteless Ague Drop*. Each fluidrachm of the official preparation of the Pharmacopœia of the United States contains half a grain of arsenious acid. The usual dose is eight or ten drops two or three times a day. It has been prescribed, however, in larger quantities without any manifest inconvenience.

62. SALIX.—WILLOW.

The only species of willow, introduced into the Pharmacopœia of the United States, is *Salix alba* or *white willow*; SEX. SYST. Diœcia Diandria; NAT. ORD. Salicaceæ. This species is received, also, by the London College; whilst the Edinburgh acknowledges *Salix caprea* or round-leaved willow; and the Dublin *Salix fragilis* or crack willow. Dr. Pereira has suggested, that to judge of the therapeutical value of different species of salix, the best practical rule to follow would be,—to select those whose barks possess great bitterness combined with astringency; and the same rule is applicable to the species, that are native in this country, and are probably of as much therapeutical value as *Salix alba*, which is indigenous in Europe; but has been introduced here and is now very common; flowering in April and May. In the dried state, the bark is usually quilled, and devoid of odour. It has a

bitter and astringent taste ; and yields its virtues to water and alcohol. It is in the secondary list of the Pharmacopœia of the United States.

Willow bark possesses similar virtues to *Cornus Florida*, and, like it, has been employed not only as an ordinary tonic but as an antiperiodic. It may be given in the same doses and cases as cinchona. It has acquired more attention in consequence of the separation of its active principle, called

SALICIN. This is prepared by preference from *Salix helix*, but it is found, likewise, in the barks of other willows—as *Salix alba*, *S. vitellina*, *S. purpurea*, *S. Lambertiana*, *S. pentandra*, *S. polyandra*, *S. fragilis*, *S. viminalis*, &c., and in the leaves and barks of several species of poplar—*Populus tremulus*, *P. tremuloides*, *P. alba*, and *P. Græca*. The various modes of preparing it are given by the author in another work, (*New Remedies*, 5th edit. p. 550, Philad. 1846). It crystallizes in very fine silky masses of white crystals, which have the appearance of mother of pearl. It is devoid of smell ; but has a strong enduring bitter taste, with a balsamic flavour like that of the bark of the willow. One hundred parts of cold water dissolve six parts of it. It is more soluble in warm water, and, likewise, in alcohol ; but is not soluble either in ether or the essential oils. It has no alkaline reaction.

Salicin has been largely employed in intermittent fever, and with very successful results. Sentiments, however, in regard to its antiperiodic powers are discrepant ; some placing it far beneath the sulphate of quinia, others above it. By general consent, however, it is regarded as inferior. Comparative trials were directed a few years ago by Surgeon-general Lawson ; but the author has not seen the results. Such an investigation was made by Dr. Fenner, of New Orleans, who arrived at the conclusion, that “the average amount of quinia required to cure twenty cases of intermittent fever, and costing twenty-five cents, is fully three times as efficacious as the average amount of salicin required in a like number of cases, and costing seventy-five cents.” Dr. Fenner’s report has all the appearance of accurate and impartial observation.

The dose as an antiperiodic is four or five grains, repeated according to circumstances : as a tonic, it is less.

63. PIPERINA.—PIPERIN.

Black pepper, infused in whisky, has long been a popular remedy, with sailors, in intermittents ; and it is probable, that its virtues, in such cases, are dependent both upon piperin, and acrid oil, which the pepper contains. Piperin exists in black, white, and long pepper, and also in cubebs. At first it was regarded as a vegetable alkali ; but M. Pelletier subsequently analyzed it carefully, and showed that it was not such, but bore considerable analogy to resins, and was of a peculiar nature. He farther denied it all medicinal activity ; but in this he was mistaken. He spoke as a *pharmacien*, not as a therapist.

When quite pure, piperin forms colourless rhombic prisms, which are insoluble in water, but soluble in alcohol and ether. It is generally de-

scribed as bland, when quite pure ; but Dr. Christison states, that the purest he has been able to obtain, was as acrid as that which was brownish ; and emitted an intensely irritating vapour when thrown on a heated iron plate.

Piperin has been given largely by the Italian physicians, especially in intermittent fever ; and, they affirm, with very great success. Opinions, however, in regard to it, have been discrepant. It may be prescribed in the same cases as sulphate of quinia, in the dose of from gr. ij to vj and more, made into pill with extract of gentian, and repeated according to circumstances.

64. CORNUS FLORIDA.—DOGWOOD.

The bark of *Cornus Florida*, *Dogwood*, SEX. SYST. Tetrandria Monogynia ; NAT. ORD. Caprifoliaceæ—an indigenous tree, which flourishes in every part of the United States—is officinal in the Pharmacopœia of the United States. Dogwood is a well known ornament

Fig. 141.



Cornus Florida.

of the American forests, by reason of the multitude of large white flowers, which it sends forth in May. The bark is obtained from every part of the tree ; but that of the root is preferred.

As met with in the shops, it is in pieces of various sizes, commonly more or less rolled ; and, at times, covered with a fawn-coloured epidermis. Its smell is feeble ; taste bitter and astringent. At one time, it was stated to contain a peculiar principle, to which the name *Cor-nine* was given ; but if such exist, it is not used. Like other bitter barks, it yields its virtues to water and to alcohol.

Cornus Florida was at one time much given as an antiperiodic, and doubtless still is in many parts of the country. Like most of these agents, however, it has fallen into comparative disuse since the introduction of sulphate of quinia.

It possesses tonic virtues, and may be given in all cases in which cinchona is indicated, although far inferior to it in efficacy. In intermittent fever, the powder may be prescribed in the dose of a drachm, repeated so that an ounce or more may be taken during the apyrexia. As a tonic, it may be given in *infusion*:—(*Cornus Florid.* ʒj; *Aquæ bullient.* Oj.) The decoction is the only official preparation.

DECOC'TUM CORNUS FLORIDÆ, DECOCTION OF DOGWOOD. (*Cornus Florid.* ʒj; *Aquæ bullient.* Oj.) The dose, as a tonic, is f.ʒiiss to f.ʒiij and more.

65. *CORNUS CIRCINATA*, ROUND-LEAVED DOGWOOD; and—66. *CORNUS SERICEA*, SWAMP DOGWOOD, both indigenous in the United States, yield barks which are official in the secondary list of the Pharmacopœia of the United States; and which possess the same virtues, and are inservient to the same uses as the bark of *Cornus Florida*.

67. *LIRIODENDRON*.—TULIP TREE BARK.

Liriodendron Tulipifera, *Tulip tree* or *Poplar*; SEX. SYST. Polyandria Polygynia; NAT. ORD. Magnoliaceæ, is a well known boast of the American forest,—bearing, in May, numerous flowers, which have a resemblance to the tulip; and have hence obtained for it one of its popular names. The bark is official in the secondary list of the Pharmacopœia of the United States. In the shops, it is in pieces of various sizes; of a yellowish white colour, and easily broken. That obtained from the root is generally preferred. Its taste is aromatic, pungent and bitter,—properties which are imparted to water and alcohol. The aromatic and pungent property, however, is injured by decoction. It was separated by the author's late friend—Professor Emmet, of the University of Virginia—who called it *Liriodendrine*. It does not resemble quinia in its chemical characters. It unites with neither alkalies nor acids; and appears to hold a place between the resins and essential oils. It has not been used in medicine.

Fig. 142.



Liriodendron tulipifera.

Tulip tree bark has been prescribed under the same circumstances as that of dogwood; its dose in the apyrexia of intermittents being, in powder, ʒj. As an ordinary tonic, it may be prescribed in *infusion*. (*Liriodendr.* ʒj; *Aquæ bullient.* Oj. Dose, f.ʒiiss to f.ʒiij.) The Pharmacopœia of the United States contains no official preparation of it.

68. *HIPPOCASTANUM*.—HORSECHESTNUT.

Æsculus Hippocastanum, *Horsechestnut*, *Buckeye*; SEX. SYST. Hep-tandria Monogynia; NAT. ORD. Hippocastanæ, is indigenous in the mountainous regions of Asia Minor and Persia, and grows in this coun-

try as well as in Europe. The bark is the part employed in medicine: it has an astringent bitter taste, and contains a considerable quantity of tannic acid. A peculiar principle, *Æsculine*, is said to have been discovered in it; but this has been contested.

Fig. 143.



Æsculus hippocastanum.
a. Flower. b. Fruit.

The bark has been long used as an astringent; and in modern times has been brought forward as a substitute for cinchona. It would seem to accord most in properties with willow bark,—the latter appearing, however, to be more effective, and to agree better with the digestive organs. It was much used during the wars of Napoleon, when cinchona was scarce. It has, likewise, been administered as an astringent tonic when such an agent was indicated. Many of the European pharmacopœias have an aqueous extract of the bark, which is said to agree better with the stomach than the powder or decoction.

The following *Factitious Powder of Bark* is contained in the Prussian Pharmacopœia:—*R. Cort. Hippocast., Cort. Salicis, Cort. Gentian. rubr., Calam.*

Aromat., Caryophyll. āā. ʒij.—M. In this preparation, the willow—as already remarked—has medical virtues analogous to those of horse-chestnut bark; gentian is a simple bitter; and calamus and cloves are excitants. Hufeland affirms, that this powder is an adequate substitute for cinchona in three cases in four.

69. NARCOTINA.—NARCOTIN.

Narcotin is obtained either from the aqueous extract of opium of the shops by means of ether, which dissolves only the narcotin, and consequently requires only to be evaporated to obtain it; or from crude opium, which has been exhausted by *cold water*. Narcotin crystallizes in white needles; is devoid of taste and smell; neutral; and, of course, very soluble in ether. It is also soluble in hot alcohol.

As elsewhere remarked, narcotin was supposed to be the excitant property of opium; morphia the sedative; but subsequent researches have not established this.

Although it is insipid, its salts are intensely bitter. The sulphate and the muriate have been used as antiperiodics,—the latter with great success. The following is the mode of preparing the latter salt, which was employed by Dr. O'Shaughnessy in India as a substitute for quinia.

Take of *Bengal opium*, two pounds; *alcohol*, twenty pounds. Rub them in a large mortar, adding the alcohol gradually until the opium is robbed of its soluble portions. The solution is then decanted, and the insoluble part pressed. To the alcoholic solution as much *ammonia* is added as renders the liquid slightly turbid. Fifteen pounds of the alcohol are then distilled from a common alembic; and the fluid in the still is drawn off, and set aside to cool. On cooling, a mass of coloured crystals is deposited, which is composed of narcotin, meconate of ammonia and resin. This is washed with water, which dissolves the meconate; and afterwards with a quart of water and a drachm of muriatic acid, which dissolves the narcotin and leaves the resin. The solution is then filtered and evaporated to dryness.

The muriate, thus formed, is a transparent, resinous mass, of a rosy colour, and brittle vitreous texture. It is very soluble in water, and alcohol; and intensely bitter. It has been prescribed largely in India in intermittents. Sixty cases were treated by Dr. O'Shaughnessy, of which all but two were successful; and the same gentleman refers to one hundred more, which had been treated by his pupils and acquaintances, with perfect success, by the same remedy.

70. PHLORIDZINA.—PHLORIDZIN.

The bitter principle, to which the name *Phloridzin* has been given, exists in the bark of both the trunk and the root of the apple, pear, cherry and plum tree. It is obtained by boiling the fresh bark of the root of the apple tree in sufficient water to cover the bark; decanting the decoction, and boiling again with a little more water. On uniting the decoctions, and permitting them to stand for twenty-four hours, the phloridzin is deposited in granular crystals. One thousand parts of water, at a temperature from 32° to 71° , only dissolve about one part; but at from 71° to 212° , water dissolves it in all proportions. It is also very soluble in alcohol at ordinary temperatures. It has no action on test papers.

Ten to fourteen grains of phloridzin have occasionally arrested an intermittent after sulphate of quinia had failed. The testimony of many observers is, indeed, in favour of its antiperiodic virtues. It may be given, made into pill with extract of gentian as an excipient. It has also been administered in enema.

71. CETRARINA.—CETRARIN.

Cetrarin is obtained from *Cetraria Islandica*, (i. 252,) by boiling coarsely powdered cetraria in four parts of alcohol; filtering the solution when tepid; acidulating with diluted muriatic acid; diluting with three times its volume of water, and allowing crystals to form slowly. The crystals may subsequently be purified. Pure cetrarin which—it has been recently affirmed, is a compound of three distinct substances—is of a white colour, and intensely bitter taste. Its best solvent is alcohol. It is very sparingly soluble in water, hot or cold. The acids do

not unite with it. From a pound of cetraria, 135 grains of pure cetrarin were obtained.

It has been given as an antiperiodic in intermittents, in the dose of two grains every two hours during the apyrexia; but it has not been used in this country. It has been suggested, that an alcoholic solution should be prescribed in place of the cetrarin itself; and it may act more speedily, for the same reason that a solution of the sulphate of quinia is more effective than the salt in substance.

72. BEBEERINA.—BEBEERINE.

In the year 1843, Dr. Douglas MacLagan read a paper on the chemical history of the *Bebeeru Tree*, of the species *Nectandra*,—*N. Rodiæi*; SEX. SYST. Dodecandria Monogynia; NAT. FAMILY, Lauraceæ, which grows in British Guiana. The bark and seeds yield two alkaline bodies, which he calls *bebeerine* and *sipeerine* from the Indian and Dutch names of the tree. The sulphate of the former has been proposed as a substitute for sulphate of quinia; with which, indeed, it appears to possess analogous properties. Of late years, in Edinburgh, a great improvement has been made in its manufacture, so that it is now prepared at less than half the price of the sulphate of quinia. (Christison.) From a scruple to a drachm between the paroxysms of a tertian is generally sufficient to arrest the intermittent. Its antiperiodic virtues are very decided. According to Dr. MacLagan, a secret preparation, sold under the name of "*Warburg's Fever Drops*," appeared, on chemical examination, to be a tincture of bebeeria, made, probably, from the seeds of the bebeeru tree. It is doubtful, however, whether this is the case.

III. ASTRINGENTS.

SYNON. *Constringentia, contrahentia, stegnotica, syncritica, adstrictoria.*

Definition of astringents—Tannic acid the great vegetable astringent principle—Their *modus operandi*—Act best on parts with which they come in contact—Bad effects of astringents—Indirect astringents—Therapeutical application—In fevers, inflammations, hemorrhages, &c.—Astringents often used by the surgeon—Styptics—Special astringents.

ASTRINGENTS are defined, by Dr. A. T. Thomson, to be substances, which produce contraction and condensation of the muscular tissue; but in his table of classification, he ranges them amongst vital agents, that operate on the "muscular and sanguiferous systems." There is no reason, however, why their operation should be restricted to those systems. They affect also, as remarked by the Messrs. Schroff, the skin, mucous membranes, cellular tissue, and the glandular, and parenchymatous organs; and a better definition would be, simply, "agents, that occasion contraction, and condensation of the tissues."

The inconsistency in the two definitions by Dr. Thomson, given above, is much less, however, than that developed in a subsequent part of his section on astringents, where he proceeds to give his theory on

the nature of astringency. By a reference to his table of classification, (vol. i., p. 97,) it will be found, that he separates *Excitants*, *Sedatives*, *Refrigerants*, *Narcotics*, and *Antispasmodics*—which operate directly on the nervous system—from *Tonics*, and *Astringents*, which operate on the muscular and sanguiferous systems; yet, the development of his theory, regarding the action of the last class, shows convincingly, that he ought to have referred it to the division, which comprises the various agents that act directly on the nervous system. “I conceive it to be a power,” he remarks, “which, through the medium of the motor nerves, acts on the *insensible* contractility of the muscular fibril, producing a closer approximation of their component particles; and, by thus augmenting their cohesion, causing a greater and more permanent density, and a corresponding vigour in the muscular tissue. This action differs from ordinary muscular contraction, in not being dependent on the nerves of sensation; and, consequently, in not being the result of any communication with the sensorium; in not exhausting excitability; and in the permanency of its effects. The movements constituting muscular contraction are the consequence of impressions conveyed to the brain through the sensitive nerves, and thence to the motor nerves of the part: the contractions following the application of astringents are the result of direct impressions on the motor nerves themselves, altogether unconnected with those of sensation.”

It is doubtful, whether any such direct agency on the nerves be exerted by astringents. It is more probable, that the primary effect is upon the intimate tissues of organs, as astringents are capable of producing condensation and contraction in parts that are deprived of the vital influence; and, although much has been said against the idea, that anything like tanning can be effected upon the living tissues by the operation of this class of medicinal agents, the explanation does not appear to the author as wide of the mark as it has been conceived to be by many. The vital influence prevents the precise chemical changes from being effected,—the requisite union of the gelatin of the skin, for example, with the tannic acid of oak bark,—but it does not prevent the condensation and corrugation of tissue, something similar to which is produced in the dead fibre, as well as in vegetables—organized bodies that are devoid of nerves.

Astringents may be used *internally*, either for the purpose of acting upon the parts with which they come in contact, or indirectly on distant parts; or *externally*, particularly with the view of arresting hemorrhage,—when they are called *styptics*; and a difference has been made amongst these, according as they act chemically or mechanically;—the chemical styptics coagulating the blood exuding from the part, and, at the same time, stimulating the tissues to contraction; whilst the mechanical—as felt, agaric, lint, &c.—detain the blood in their meshes; or absorb it, until it coagulates, and thus arrest the hemorrhage.

Astringents can be readily detected by the taste. They convey a sense of roughness to the palate, which cannot be mistaken; but which is more marked in some substances than in others. It is thus, that the mineral acids,—alum, and the various metallic salts, and vegetables,—are readily detected as astringents.

The vegetable kingdom furnishes largely to this division of therapeutical agents; and the property, on which their virtues are mainly dependent, is tannic acid—the *principium scytodephicum* or Gerbestoff of the Germans. This is associated with gallic acid in galls, krameria, tormentilla, uva ursi, &c.

The action of astringents, when taken internally, may be altogether local on the tissues with which they come in contact; or the excitant effect,—for it is excitant,—may be communicated to other parts of the frame, as in the case of tonics; so that the action of organs at a distance may be modified; and immoderate discharges from them be, in this manner, arrested. When such is the case, the hemorrhage may be controlled, in consequence of the simple tonic influence exerted by the astringent; for it is not easy to see how the effect of the astringent itself can be extended beyond the part which it immediately touches;—or, the astringent principle may pass into the mass of blood by absorption; and come in contact with the vessels whence the immoderate discharge is proceeding. This *may* be the case, but it is difficult to conceive, that a small dose of an astringent substance, received into the blood, can proceed to the seat of an undue flow, and there act in sufficient concentration to produce any manifest astringent agency; yet this is the *modus operandi* according to many writers. Dr. Thomson, indeed, asserts, that, “without such a supposition, we should not be able to explain the manner, in which they [astringents] act in stopping hemorrhage, when internally administered, especially when taken into the stomach;” and he adds:—“Mr. Brodie gave a patient, who had a frightful hemorrhage from the prostate gland, and in whom all other remedies had failed, a dose of Ruspini’s styptic, and repeated the dose twice in the course of twelve hours. About half an hour after the first dose was taken, the bleeding ceased, and it never recurred.” This styptic is said to consist of gallic acid, a small quantity of sulphate of zinc, and opium, dissolved in a mixture of alcohol and rose water; but, as the quantity of sulphate of zinc, and opium, appears too small to influence the medicine, a simple solution of gallic acid in diluted alcohol, it has been conceived, will answer all the purposes of the expensive nostrum. The above case, however, is insufficient to establish the fact of absorption; and, without meaning to deny, that the styptic in it did exert agency in arresting the hemorrhage, the author does not think, that a solitary instance of the *post hoc* is sufficient to establish the *propter hoc*. Dr. Thomson, indeed, himself admits, that he has not witnessed its influence, as an internal or general astringent; although he has frequently observed its power in checking the most obstinate bleedings from leech bites in children, after all other means had failed.

Another mode in which astringents may act, in certain cases, is by passing into the mass of blood, and increasing the tendency to coagulation of that fluid.

It is manifest, that in all increased discharges, which occur from parts that can only be reached through the medium of the circulation, no signal advantage can be expected from the administration of astringents; on the other hand, where they can come into immediate contact with

the seat of the disease, they may be more relied upon. Accordingly, in hæmatemesis and epistaxis, and in chronic diarrhœa, and dysentery, their action is more marked than in hæmoptysis, immoderate flow of the menses, or leucorrhœa; inasmuch as, when taken internally, they can only act on the lungs, uterus or vagina, either by the impression they make on the general system through the nerves of the stomach, or by being taken into the circulation.

Under the view, everywhere embraced by Dr. Chapman, of Philadelphia, in his "*Elements of Therapeutics*," that the vital action of parts resists anything like chemical change;—that "so long as vitality endures, every chemical action or combination is repelled by powers and resources peculiar to the animated condition," the *modus operandi* of astringents becomes a weighty stumbling block. "Nevertheless," he remarks, "there would seem, at the *first view*, to be a class of articles endowed with the property of corrugating or contracting the living fibre. This is especially evinced by the sensation, which they impress upon the tongue and fauces; and, perhaps, still more conspicuously by their efficacy in restraining hemorrhages from wounds. Yet how they operate has never been very intelligibly explained. Their effects are ascribed altogether by Darwin to the power of promoting absorption. Whether they have such a property is exceedingly doubtful. Conceding it to them, however, it will not, in the slightest degree, account for their suppression of hemorrhage."

This is all that Dr. Chapman says of the general *modus operandi* of astringents. He offers no view of his own; and, indeed, appears to doubt, whether there be any agents endowed with the property of corrugating or contracting the living fibre; inasmuch as he says, there would "seem, at the first view," to be a class of such articles,—leaving the inference to be deduced, that farther examination would exhibit its non-existence. We can have no more doubts, however, of the astringent agency of such a class of substances,—modifying the condition of the living fibre, in the mode mentioned,—than we have of the reality of cathartics, emetics, or narcotics.

In all cases where profuse discharges have to be checked, it is important to inquire, whether they be accompanied by unusual activity of vessels, or, in other words, of the kind generally regarded and denominated *active*,—or whether they be *passive*. Some have denied, that there can be such a state as passive hemorrhage, but it can be readily understood, that there may be a condition of vessels in which their texture is so loosened as to permit the blood to transude with facility from within to without; and, accompanying, or not, this condition, there may be a degree of fluidity and impoverishment of the blood, that may adapt it for a more ready transudation than when it contains more fibrin, and red corpuscles. The author attended a young female, who, in consequence of hyperæmia of the encephalon, had been bled every fortnight for several months, to the extent of a quart or more; and in whom it was an object of moment to break in upon the habit thus induced. Her whole appearance was anæmic. She was pale, apparently almost exanguinous; the pulse was small, indicating the presence of but little blood in the vessels; yet at the usual interval of a

fortnight, signs of augmented action in the vessels of the head supervened; and it was for a time esteemed indispensable to repeat the blood-letting. The author's endeavour was to gradually break in upon this habit;—to cup her, when the encephalic symptoms made their appearance; and, by revellents, to direct the afflux of blood elsewhere. Occasionally, however, it was necessary, in consequence of the super-vention of delirium, to take away a pint of blood, and this was largely composed of serum,—affording the strongest proof of that form of hyperæmia, which is characterized by impoverishment and deficiency of the circulating fluid. The original mischief was probably in the great nervous centres; and blood-letting was doubtless, in the first instance, appropriate; but the frequent repetition of it was well adapted to lay the foundation for periodical irregularities of circulation, like those under which she was suffering, and from which she ultimately recovered under the plan recommended by the author. The case is an elucidation of the fact—often referred to in these pages—that hyperæmia may be induced by agencies, that are regarded as best adapted for its removal, provided such agencies be pushed to an inordinate extent; and it is an additional evidence in favour of the importance of attending to the state of the nervous system, under whose influence hyperæmic affections are often developed; and where the indication of cure is less to withdraw the circulatory fluid than to allay the nervous irritability, which gives occasion to the excited state of capillary vessels, that constitutes most of the varieties of hyperæmia.

From what has been said it obviously follows, that in acute inflammations of mucous membranes, accompanied by increased discharges, powerful astringents may be—to say the least—of doubtful propriety; whilst in chronic inflammations, where debility of capillaries exists they may, like excitants, be the best class of agents that could be had recourse to. Care, however, has always to be taken with regard to their strength. M. Broussais has properly remarked, in one of his propositions, that “vegetables, which are astringent in small doses, produce gastro-enteritis when taken in large doses.” But this does not apply to the gastro-enteric mucous membrane solely. The sudden application of a powerful astringent condenses and corrugates the mucous tissue, so that the calibre of the vessels is diminished below the natural; the circulation through them is consequently obstructed; and hence supervenes increased action of the vessels that are continuous with the constricted capillaries. In another proposition, M. Broussais affirms, that “the mineral astringents, the sulphates of alumina, of zinc, and of iron, act nearly in the same manner as the preparations of lead, except that the latter produce a truly deleterious effect on the nervous system:” “the primary action of all,” he adds, “is stimulating; they all contract the fibres, and afterwards diminish the innervation.” He asserts, too, that when astringents are applied so as to arrest the “serous elimination” of the skin, an internal exhalent action succeeds; and, as an instance of this, he adduces dropsies, that immediately follow the application of an astringent, which has repelled itch, tetters, and even acute inflammation—as erysipelas. “Similar dropsies have been sometimes induced by frictions with ointments containing sulphate of alumina, sulphuret of

potassa, or baths impregnated with corrosive sublimate, employed for the cure of prurigo or obstinate itch."

Without meaning to deny, that where an accustomed irritation has been suddenly repressed, it may be transferred elsewhere; and that where a long established drain is arrested, exhalation may be produced in other parts of the system,—it is proper to observe, that the author has never witnessed dropsy induced in the manner referred to by M. Broussais; nor is he disposed to admit, that it could readily happen. The surface, in a case of tetter, is so small, and the elimination effected from the skin of the part so trifling, that it appears improbable, that any augmentation of internal exhalation could be induced to such an extent as to give rise to dropsy, by astringent or other agents employed for the removal of the cutaneous eruption.

The astringent medication is considered, by many writers, under the head of tonics; and some of the substances in the catalogue of the *Materia Medica* eminently possess tonic or corroborant virtues. Such is the case with cinchona; yet its chief virtues are not dependent upon this astringency, as quinia possesses none of it. It is obvious, that the efficacy of astringents may vary according to the principles that are united with them; and this may give occasion to the exertion of some choice to adapt them to particular conditions of disease.

The most potent of the vegetable astringents are indebted for their properties to the tannic acid they contain; but many others have a bitter or an aromatic principle associated with the astringency, and have therefore, been termed respectively, by some of the Germans, *amaro-adstringentia*, and *balsamico-adstringentia*,—as *salix*, *hippocastanum*, *juglans regia*, the *caryophyllatæ*, and especially the *cinchonæ*, &c.

Thus far the author has referred only to the action of *direct astringents*: profuse evacuations may, however, be connected with different states of the living system; so that agents, possessed of no astringent properties, may yet check them; or produce an astringent operation, indirectly. Hence we have '*direct*' and '*indirect*' astringents, as we have direct and indirect tonics. Opium, for example, by allaying the augmented peristole in diarrhœa, may exert an action of astringency, and diminish the number of discharges; and, accordingly, it is often had recourse to in such cases. Again, the increased discharges of dysentery are induced by an inflammatory condition of the mucous coat of the intestines. Bleeding, therefore, by allaying this inflammation; and castor oil, given occasionally so as to gently remove the morbid secretions, by taking away the cause may check the effects. A predominance of acidity in early infancy lays the foundation to many of the bowel complaints which are so common at that age, and keeps them up when once established. A proper antacid, by neutralizing the acid, takes away the cause, and thus becomes an indirect astringent. In active hemorrhage, where a condition closely allied to inflammation exists, the flow of blood is arrested by antiphlogistic remedies, which thus become astringents; and, lastly, cold is one of the most valuable of the indirect astringents which we possess, especially in hemorrhages of the active kind. Much of this effect is, doubtless, produced by its temperant,

antiphlogistic or refrigerant operation, which—it will be seen hereafter—is manifest. Where, however, cold—as in the form of ice or iced water—can be made to come in contact with the bleeding part, it produces condensation and corrugation of the tissues; diminished calibre of the vessels; and coagulation of the exuding fluid, in the same manner as substances that belong to the class of direct astringents. When properly used, it is really one of the most valuable astringents that we possess.

Therapeutical application of Astringents.

Fever.—With regard to the therapeutical application of an astringent medication, it need scarcely be remarked, that it is inadmissible in fevers, unless they should be complicated, in the latter stages, with symptoms especially indicating its employment. In *intermittents*, they have been frequently used, and often with decided advantage. Generally, however, the astringents that have been employed in such cases, have possessed other properties on which their efficacy was dependent. The author has already observed, that the different varieties of cinchona contain a principle, which is not astringent, along with another that is; yet the former exerts all, or almost all, the astringent power, which the bark in substance is capable of exerting. At times, however, we meet with cases, in which the bark in substance succeeds, when quinia has failed; and it is not improbable, that in such cases the astringent property may aid the tonic or febrifuge in arresting the disease.

The dynamic influence of the tonic on the body is manifestly of a nervous character; and the author has attempted to show, that astringents are capable of exerting one of a similar kind; so that even when the latter are administered in an uncombined state, they may succeed in putting a stop to intermittents. Astringents are, however, but rarely employed, inasmuch as we possess valuable agents of another kind for effecting all that they can accomplish, and more too; but there may be pathological conditions, during the existence of an intermittent, which may demand their use; as when the ordinary antiperiodic tonics run off by the bowels, or when discharges supervene, which, if allowed to persist, might be attended with injurious consequences.

Inflammations.—During the active stage of inflammations the same rule applies to the administration of astringents as to that of excitants. Although occasionally employed with success during the violence of *external inflammations*, or those of the dermoid tissue, their efficacy is more decided after the violence of the inflammation has passed away, and when a state of over-distention of the extreme capillary is the chief pathological condition that keeps up the excited action of the vessel communicating with it. In some inflammations, however, their beneficial agency, like that of excitants, is manifested from the first. Such are inflammations of the tunica conjunctiva, of the tonsils, velum pendulum, and of parts of the mucous membrane, which admit of being inspected, as of that which lines the mouth and fauces;—or which can

be reached by them in their undiluted state, as the inflammations that characterize blennorrhœa or gonorrhœa, and leucorrhœa.

In conjunctivitis, occasionally from the first, and almost always in what is called the catarrhal variety, after the violence of the action of the vessels has been somewhat got under by the employment of appropriate antiphlogistics, the advantage of the astringent metallic compounds, especially of the nitrate of silver, is often signal. As soon as it is dropped in solution into the eye, decomposition occurs, in consequence of its meeting with chloride of sodium contained in the tears. It becomes converted into chloride of silver, which is recognizable by its white appearance; but the constringency, exerted by it on the vessels, tends to restore them to their wonted calibre.

In that sluggish variety of sore throat in which the mucous membrane covering the tonsils is of a diffused dusky red; extending over the velum pendulum and the uvula, and giving occasion to tumefaction and relaxation of those parts, excitant and astringent gargles are the best applications that can be used. The vessels are here loosely situate in the parts in which they creep; remora of the fluid circulating within them is consequently facilitated; turgescence results; and this state is not removed until the vessels resume their wonted calibre,—a result, which can be rendered more easy by the appropriate employment of astringents.

In the malignant affections of the throat, which are concomitants of some of the forms of scarlatina, the same class of remedies is employed as local applications; some vegetable infusion or decoction, which contains tannic acid, being generally used, with or without the addition of one of the mineral acids. The decoction of cinchona, with associated sulphuric or muriatic acid, is a common combination for this purpose.

In those affections, too, of the mucous membranes, which are attended with the formation of a pellicle or an exudation from the inflamed mucous surface, and which were first termed by Bretonneau *Diphthérites*, astringents are found to be extremely useful after the violence of action has been subdued, and the pellicle has formed. The most successful of these, again, is the nitrate of silver. When this salt is applied in solution to the mucous membrane of the mouth in a case of aphthæ, or to the fauces in cases of diphtherites of the pharynx, larynx or trachea, the new action, induced in the part to which it is applied, is extended to the membrane lower down, and the most salutary agency is, at times, exerted. The exudation of coagulable lymph,—which the experiments of Schwilgué prove to correspond, in its properties, with fibrin, and which constitutes the false membrane in cases of diphtherites,—frequently begins on the surface of the tonsils; and thence spreads along the arches of the palate, and ultimately descends over the internal surface of the pharynx and œsophagus, as well as of the larynx and trachea. The application of a solution of nitrate of silver to the tonsils, velum palati, and uvula, frequently removes the albuminoid exudation; produces manifest relief of the symptoms; and ultimately dispels them. Dr. Eberle asserts, that he has seen one instance in which this application was made; and the result gave him a very favourable impression of

the practice; but he says it must be confined to cases in which the fauces are found, on inspection, to present an irritated and inflamed condition. This is not, however, essential. The astringent effect upon the part of the mucous membrane with which the solution is made to come in contact, may be propagated by continuous sympathy to the part of the trachea lined by the false membrane; a new action may be induced; the albuminoid substance be detached, and ultimately thrown off, although it is obvious, that when a complete adventitious tube is formed in the trachea, and of course, below the rima glottidis, the narrowness of the aperture into the larynx must, in by far the majority of cases, render the evacuation of the adventitious tube impracticable. With a similar object, M. Laënnec directed the inhalation or insufflation of very finely powdered alum—and he asserts, that it generally afforded great and speedy relief,—not only in tracheitis, but also in laryngitis, and amygdalitis.

Hæmorrhage.—The author has more than once referred to the importance of examining, in all cases of hæmorrhage, whether they be active or passive,—characterized, that is, by polyæmia, or hyperæmia, by hypæmia or anæmia. In the former category, the use of astringents can in no wise be demanded. The fulness or the activity of vessels must be first reduced before the astringent medication can be adopted. In but few of the cases of hæmorrhage does the blood flow from a ruptured vessel. It generally passes out by diapedesis or transudation; and this may be of course favoured both by fulness of vessels, and by any causes that induce a remora of blood in them. The bleeding that takes place in this way has been considered as an effort of nature to relieve this condition, inasmuch as it unloads the distended vessels; and, when this occurs, the plethora being reduced the hæmorrhage generally ceases spontaneously. Of these fancied ‘efforts of nature’ the author has already spoken; and this has no more foundation. The fulness of vessels gives occasion to a physical transudation from within to without, and as this transudation removes the cause,—the effect, the hæmorrhage, necessarily ceases.

In the passive state of hæmorrhage, where there is loosened cohesion of parts, often combined with anæmia, or with blood poor in fibrin and red particles, and rich in serum—as in sea-scurvy, and in some of the hæmorrhages, that supervene in the worst cases of typhus, and other diseases of prostration,—the use of tonics and astringents is absolutely needed; and if the latter can be brought into contact with the vessels exhaling the fluid, they occasion a condensation and corrugation of their parietes, so as to render transudation less easy. They are, indeed, the chief resource of the physician. The mineral acids, when added to blood out of the body, coagulate its albumen; and it is probable, that they exert an analogous action, when taken as medicinal agents, in the cases under consideration. Their efficacy—as well as that of creasote—in scurvy, and in passive hæmorrhage of every kind, may be greatly owing to their increasing the tendency of the blood to coagulate.

Epistaxis is one of the most common varieties of hæmorrhage. Generally it occurs in youth, and is of no consequence. There are but

few individuals, about the age of puberty, who are not more or less subject to it. In such cases, it is usually an active hemorrhage, and does not require the use of astringents. In the evolutions, that occur at puberty, and some time afterwards, irregular hyperæmic determinations are apt to supervene; and, as the vessels of the Schneiderian membrane are but loosely protected by the parts in which they creep, and therefore yield more readily to any distending force, diapedesis easily takes place through them. The system of medication is here sufficiently simple. If the hemorrhage should recur repeatedly, and not be excessive, the depletion and the revulsion, excited by a dose of a saline cathartic—as sulphate of magnesia—are often enough to rectify the evil; or if it should not yield to these, it frequently will to a repetition of the remedy along with the employment of a dry and spare diet. If much fluid be taken, either in cases of spontaneous hemorrhage, or where abstraction of blood is recommended for the removal of disease,—owing to the vessels being deprived of their usual quantity of circulating fluid, the activity of absorption is greatly augmented; and the drink passes rapidly through the coats of the vessels to make up for the loss sustained by the accidental or artificial hemorrhage. In this way, the same quantity of fluid may soon be in the vessels; but it must necessarily be more tenuous—less rich in fibrin and red corpuscles—and the consequence is, that it soaks through the vessels more readily than it did in the first instance; and thus a foundation is laid for future recurrence of the hemorrhage. This abstinence from drinks is one of the most important practical precepts that can be inculcated in the management of the different hemorrhages. If the hemorrhage from the nose should be so profuse, at any one time—or if it should recur so frequently—as to bring on signs of hypæmia or inanition, it becomes the duty of the physician to have recourse to the class of remedial agents, whose properties are now under consideration.

It is a common custom to apply cold water to the nape of the neck, or a piece of cold iron—as a key; and this simple agency often arrests the flow of blood from the Schneiderian membrane. This effect is probably induced by the impression made on the nerves occasioning a diversion of the blood from the vessels of the membrane; and a similar agency may perhaps be exerted, where mental impressions prove hæmastatic;—as in the case of charms, employed in such cases, in antiquity more especially, and not wholly abandoned at the present day. The impression on those vessels can, of course, be only of a sympathetic character. In cases of anæmic hemorrhages, however, more direct applications become necessary, and recourse is had to metallic astringent salts, to alum, dilute sulphuric acid, and to plugging the anterior or posterior nares,—to the former, or to both, as the urgency of the case may require. In this way, both chemical and mechanical styptics are brought to bear; the former coming in contact with the vessels whence the flow of blood proceeds; and the latter preventing the escape of the blood by the anterior or posterior outlets of the nostrils, and thus favouring the formation of a coagulum around the bleeding vessel. Dr. Thomson recommends the use of internal astringents, “as the infusion of roses [!] or of kino, or some other of the astringent

vegetable substances, acidulated with diluted sulphuric acid," but much benefit cannot be expected from the action of substances on parts at such a distance from the seat of the malady. This, too, is the reason, why astringents are of less efficacy in hæmoptysis; which may take place from rupture or from diapedesis, but generally from the latter. Like all the other hemorrhages, too, it may be active or passive; but it is not very common to meet with the latter variety, unless we regard as such the diapedesis that occurs when the lungs are filled with tubercles, which is the most dangerous kind of hemorrhage from the lungs, inasmuch as its prognosis merges in that of pulmonary consumption, of which it is a symptom. The existence of tubercles interferes with the due circulation of the blood in the pulmonary and bronchial arteries; and the consequence is, that on the application of a slight exciting cause—as any unusual bodily or pulmonary exertion—a vessel gives way, or the blood soaks through its coats.

The active hemorrhage, which takes place from the lungs of a person of sound constitution,—in no wise predisposed to phthisis,—is by no means of the dangerous tendency usually conceived. An accidental circumstance may give occasion to the hemorrhage, which may be removed by appropriate measures, and may never recur.

Whenever hæmoptysis is attended with symptoms of vascular fulness or activity, indirect astringents are chiefly had recourse to—as blood-letting, and the agents belonging to the classes of sedatives and refrigerants. Little reliance is placed upon any of the articles of the *materia medica*, which are regarded as direct astringents; for the simple reason, that none of them can be made to come into direct contact, except in a very diluted state, with the vessels that are exhaling blood. There are obviously—as elsewhere stated—two ways in which such articles can act: the one is by sympathetic influence on the affected vessels, through the astringent agency exerted on the stomach; and the other by the astringent getting into the blood-vessels, and proceeding, commingled with the circulatory fluid, through the pulmonary artery to the lungs, or through the ramifications of the bronchial artery, if the flow proceeds from the latter vessel. In neither of these ways could any energetic action be exerted; and hence it is, that the scientific physician trusts to general principles in the management of the case; combating it by the agents already referred to, and by a proper attention to the antiphlogistic regimen generally. Usually, when an individual is attacked with hæmoptysis, the greatest alarm is felt; and, in all cases, it is expected that the practitioner should have recourse to blood-letting to arrest the flow. Such is the opinion of the vulgar; and occasionally it is that of the professional attendant also. This is not always, however, philosophical. Every one, who has had an opportunity of seeing many cases of hæmoptysis, is aware, that the flow of blood may be arrested at a less expense of fluid, when due attention is paid to ventilation and to posture, than when the lancet is used. A coagulum soon forms around the ruptured or transuding vessel, and the hemorrhage ceases. Whether blood-letting has to be used must depend upon other grounds:—upon the results of an inquiry into the state of the circulation, general and capillary, connected with the hemorrhage; and if there should be signs

of polyæmia, or of hyperæmia, it ought to be unhesitatingly practised, otherwise the hemorrhage may recur, care being taken—as has been remarked of all cases of hemorrhage—not to allow too much fluid to be drunk, but rather advising, that a small piece of ice should be put into the mouth occasionally, for the purpose of allaying thirst and excitement. The author is satisfied, too, that the repeated abstraction of blood, when there is no sthenic condition present, may lay the foundation for hyperæmia in the lungs, as it does in other organs; and this hyperæmia will be more apt, under such circumstances, to affect the lungs, from their being, owing to a previous attack, predisposed to the pathological condition.

Where hæmoptysis is produced by the presence of tubercles in the lungs, it is, as already said, of unfavourable prognosis, because it is one of the precursors or concomitants of phthisis. Such cases can, of course, only be palliated by an attention to the general symptoms, and by the appropriate use of sedative and refrigerant remedies. Astringents cannot here be employed with well founded expectation of success. Occasionally, too, hemorrhage from the lungs supervenes in a more advanced stage of phthisis, owing to the giving way of a vessel in the parietes of cavities in the lungs. The author has attended cases in which the individual was choked by the quantity suddenly discharged in this manner. At other times, in this disease, as well as in some of the more active inflammations of the pulmonary organs, especially in children, a copious effusion of blood suddenly takes place into the lungs, so as to completely prevent the air from reaching the pulmonary vessels; and the individual dies, owing to the pulmonary apoplexy, thus induced, occasioning asphyxia, or, in other words, completely preventing the requisite aeration of the blood in those organs.

Where blood is exhaled from the vessels of the stomach, constituting hæmatemesis, astringents can be employed with more advantage, because they come in contact with the vessels whence the hemorrhage proceeds. Here, however, it is of importance to inquire, whether the exhalation of blood may not be dependent upon obstructed circulation or mechanical hyperæmia, in some other organ; and if so, attention must be paid to the idiopathic derangement. The author has seen many cases of hæmatemesis and dropsy of the lower belly, from hypertrophy of the spleen produced by residence in a malarious locality. As a large quantity of blood is sent to the spleen, this state of the viscus prevents the free circulation of blood through it; the consequence is turgescence of vessels, which gives occasion to transudation of the watery portion into the cavity of the abdomen so as to produce ascites, and an engorgement of the vessels of the neighbouring organ—the stomach—ending in hemorrhage by diapedesis.

It is not, however, the organs in the vicinity of any infarcted or indurated viscus, that are alone liable to be the seat of hemorrhage. If the circulation be impeded in any viscus, foundation is laid for irregularity of circulation; and under this irregularity, vessels may give way, or admit of transudation in parts that are at a considerable distance from the organ, whose diseased condition is the cause of the phenomena. Thus, epistaxis is often symptomatic of visceral infarction; and the

same hemorrhage, or hæmoptysis, or hæmatemesis may be established where the uterine functions are not properly accomplished.

The same remarks are applicable to the hemorrhagic discharges from the intestinal canal, which constitute one of the forms of melæna. The lower the seat of the hemorrhage, the more mixed is the astringent before it reaches the diseased part; and, consequently, the less efficacious. Generally, in ordinary cases, of both hæmatemesis and melæna, the author has found a combination of sulphuric acid with one of the alkaline or earthy sulphates, forming a supersulphate, well adapted for fulfilling every object of the astringent medication, where this is demanded; or metallic or other astringents may be used, under the general precautions previously inculcated.

In cases of what are termed open hemorrhoids, or of hemorrhage from the rectum, astringent remedies may be made to come into immediate contact with the seat of the hemorrhage by injection. The use of gently astringent or stimulating lotions, and of laxatives, to prevent irritation from indurated fæces, is more beneficial than any other mode of treatment. Occasionally it happens, that the hemorrhage is so alarmingly profuse as to require the employment of the most powerful astringents,—of the mineral or vegetable kingdoms, and even the actual cautery. These, however, should never be used of such strength as to condense and corrugate the parts so much as to endanger the super-vention of inflammation.

Hæmaturia, or hemorrhage from the urinary organs, is a variety not directly under the control of astringents. No substance of this class can come in contact with the seat of the mischief, until it has passed into the mass of blood, and been separated by the kidneys. How small, consequently, must be the quantity of the astringent taken into the stomach, which can act at any one time upon the surface affected with hemorrhage. The best mode of managing such cases is to treat them on general principles;—by perfect quietude; avoiding all irritation; and, if there be excitement, reducing the quantity of the circulating fluid; but if, on the other hand, there be want of tone, administering substances belonging to the class of tonics, or of excitants proper. The author does not know, that, in these cases, he has observed any very marked advantage from the use of astringents, except from their tonic agency. Improvement has occasionally followed the employment of some of the metallic and vegetable astringents; but it has been produced, apparently, by the general effect, not by any direct astringent action having been exerted on the vessels of the urinary organs; for, even in those cases in which a mineral astringent can be detected in the urine, its quantity, at any one moment, in the urine distilling from the kidneys, must be too small to exert any sanative influence. Dr. Thomson, who has unbounded faith, and, perhaps, credulity on many points of therapeutics, as connected with the effect of particular medicaments, places great reliance on the use of certain astringents in hemorrhages from the urinary organs. “Hæmaturia, or bleeding from the bladder,” he says, “is generally depending upon some organic affection of the urinary organs; but in attending to the *primary disease*, much immediate advantage is derived from the use of astringents. It

was in a case of this kind that Mr. Brodie administered Ruspini's styptic with so much seeming advantage; and I have seen great benefit, in similar cases, from the use of the *uva ursi*, which appears to pass unaltered through the kidneys. Since the discovery which I have made of the composition of Ruspini's styptic, I am disposed to propose a combination of gallic acid with an infusion of the leaves of *uva ursi*, obtained by rubbing them in cold water." It may be remarked, on this passage, that, like many other articles of the materia medica, *uva ursi* has been extolled for virtues which it by no means possesses; and already it has, in the opinion of many of its former supporters, sunk to the proper level above which it ought never to have been elevated. It was formerly proposed as a remedy for calculous complaints; and for ulcerations of the urinary organs; and it is still prescribed in such cases. There are few, however, of the present day, who regard the agency it exerts to be anything more than the tonic impression made by it on the stomach.

When metrorrhagia or uterine hemorrhage occurs in the unimpregnated state, great reliance is placed on the use of sedatives, refrigerants and astringents,—the former when the hemorrhage is active, and the latter when it is more atonic. Where astringents are indicated, the tonic medication is also required, and cases occasionally occur where the safety of the patient depends upon the effect exerted, through the general system, on the vessels that are pouring out the blood. In a former section, the author has referred to an instructive case of this kind. When astringents are demanded in metrorrhagia, they can be made to come in contact with the affected vessels by means of the stomach pump. Cold water—ice cold—is, in this way, a valuable agent; as well as solutions of sulphate of zinc or other saline astringents, and infusions or decoctions of vegetable astringents,—as of red oak bark, catechu, &c.—which act as styptics. The tampon is also an excellent agent after these means have failed, by detaining the blood in the vagina, and in contact with the exhaling vessels, until it has coagulated, and thus acting as a mechanical styptic. It is an efficacious remedy in cases of hemorrhage occurring during utero-gestation. On the management necessary in these last cases, as well as in uterine hemorrhage, occurring during and after delivery, it is unnecessary to dwell, as it consists in manipulations appertaining to the science of obstetrics. Astringents are but rarely had recourse to, because during utero-gestation, and prior to the delivery of the fœtus, they cannot be easily thrown up as high as the seat of the hemorrhage; and because other modes of management can be adopted, which strike more nearly at the root of the mischief.

Hemorrhage, when the placenta is not attached over the os uteri, is owing to a partial separation of the placenta from the uterus; and the only effective mode of rectifying the evil is to cause the uterus to contract around the fœtus, and thus to compress the uterine veins. This is done by discharging the liquor amnii. Where the placenta is seated over the os uteri, the hemorrhage is unavoidable—not accidental, as in the case just described—and there is no safety to the mother or child except in speedy delivery.

Again, in hemorrhage after delivery, cold and astringent fluids might be thrown into the cavity of the uterus; but this plan is rarely had recourse to. The cause of the hemorrhage is here, also, the want of contraction of the uterus, and the means, found most efficacious, are—if the case be urgent—to introduce the hand into the interior of the organ; to irritate its inner surface with the fingers, and to press, at the same time, on the abdomen. The uterus will generally contract, so as to force the hand out of it; and in ninety-nine cases in the hundred, when the organ can be felt in the hypogastric region contracted to the size of the foetal head, the woman may, under ordinary precautions, be deemed free from all danger of recurrence. At times, the hemorrhage has returned under these very circumstances; but the instances are rare. When the case is not so urgent, simple pressure on the abdomen over the region of the uterus, continued until it is felt to be contracted, is generally sufficient. In most cases of hemorrhage after delivery, the flow of blood is so profuse, that there is no opportunity for employing any astringent solution or infusion; but in the more protracted and less alarming varieties, these agents may be employed with much prospect of advantage. They can only be regarded, however, as adjuvants. The means of primary importance are those obstetrical *manœuvres* to which allusion has been made.

The use, then, of astringents in the different forms of hemorrhage can be easily understood. In none of the active kinds can they be indicated; and in the passive, great reliance can only be reposed on them when they can be made to come into direct contact with the vessels that are discharging their blood, whether by rupture or by transudation.

Inflammations of the alimentary canal.—From the general principles laid down, it can never happen, that the employment of astringents can be looked upon as advisable in any of the more acute varieties of those inflammations of the alimentary tube, that are accompanied by discharges. Accordingly, in inflammation of the lining membrane of the small intestines, characterized by pain in the abdomen on pressure, or without; by redness of the tongue and repeated bloody or slimy discharges; as well as in the same inflammation, when seated in the large intestines, and constituting dysentery,—astringents, during the first and active period of the disease, are to be avoided; but when the complaint has persisted for a time, notwithstanding the general antiphlogistic medication and regimen, and the constant use of small doses of castor oil to remove all offensive secretions from the tube, gentle astringents—as has been shown of excitants—may be employed with much prospect of advantage. In very urgent cases, it may even be necessary to have recourse to the more powerful, administered both by the mouth and the rectum; and their agency may be augmented by the addition of opium to allay the irritability of the canal, which the state of erethism of the mucous membrane so largely develops. Of the vegetable astringents employed for this purpose, catechu and kino are the most common:—of the mineral,—alum, dilute sulphuric acid, &c.; and, if these fail, no plan can be adopted with better expectation of success than that of

completely changing the whole of the physical circumstances, surrounding the individual by travelling exercise, which, at times, removes these chronic affections of the mucous membranes, after the best directed efforts of the physician have been assiduously, but vainly, exerted.

The same principles apply to the management of *diarrhœa*, which is caused by a degree of erethism of the mucous membrane, generally produced by extraneous substances taken by the mouth, and irritating the lining membrane of the intestines. Astringents are here, in the first instance, improper. The cause of the mischief must be first removed by gentle evacuants,—as *oleum ricini*,—and it is not unless the discharges should be frequent, and colliquative, that attempts should be made to check them by astringents. At different periods of medical history, *diarrhœa* has been viewed in opposite aspects,—at times, as an effort of nature to get rid of morbid matter, and, therefore, not to be interfered with; and, at others, as always injurious, tending to debility and death, and consequently to be arrested as speedily as possible. Both exclusive views are objectionable. The cause of the mischief must be inquired into, and, if possible, removed; and, let it be borne in mind, that an increased number of evacuations may take place in consequence of the retention of indurated fecal matter in some portion of the intestinal tube;—the irritation excited by its presence inducing augmented exhalation from the lining membrane, and stimulating the muscular coat by contiguous sympathy, so as to increase the natural peristole of the intestines beyond the due bounds. *Diarrhœa* may be, in this manner, a symptom of constipation, and it is not until this state of fecal retention has been removed, that a cure can be effected. In the *diarrhœa*, which occurs in *phthisis pulmonalis* towards its close, and which is occasioned by inflammation of the lining membrane of the ileum and colon more especially, we can employ only palliatives. The *diarrhœa* is but a symptom of the hectic; and whatever remedies are used, we cannot calculate on any important advantage from them. It is usual to exhibit an opiate, which has the effect of allaying the irritation in some degree; and, occasionally, the *Mistura Cretæ* of the pharmacopœias is made the constituent of the prescription, or the infusion of catechu or kino, or some other vegetable astringent; but, for the reasons mentioned, no calculation of positive, permanent benefit can be founded on their administration. Simplicity in the formation of prescriptions is important, in order that we may be able, in all instances, to trace the effects of particular remedial agents on particular states of disease. The practitioner is often in the habit of combining remedies, taken from different classes of medicinal substances, and ‘experience’ often leads him to ascribe virtues to the combination, which are perhaps referable to one ingredient of the prescription only. Dr. Thomson gives an instance of this kind. Dr. Fordyce thought he had improved the practice in *diarrhœa* by combining astringents with diaphoretics, and he recommended a combination of *ipecacuanha* and *tormentilla*. “We now know that no effect could be ascribed to the *ipecacuanha* in this combination, as an inert tannate of emetina is formed; and, consequently, that the whole of the benefit must have resulted from the *tormentil*, which is indeed an excellent astringent in this disease.”

B'ennorrhæa.—In that specific inflammation of mucous membranes, which constitutes gonorrhœa virulenta, much difference of opinion has existed regarding the employment of astringents. When they are used at all, it is in the way of injection; and, whilst they are employed, from the first, by some practitioners, they are altogether discarded by others,—on the ground, that they are apt to induce stricture or orchitis. The author does not think there is much, if any, foundation for these fears. When such affections supervene, it is generally owing to the lesions produced by the protraction and extension of the inflammation; and the practitioner ought not to hesitate to put an end to the specific inflammation at once by an astringent or any other plan which is capable of accomplishing the object. What has been said of the use of excitants and astringents in inflammations of the mucous membranes in general applies here; and the same difficulty exists in knowing whether the over distended state of the extreme capillary, or the excited of the vessel communicating with it, predominates. When, however, the inflammatory signs are high; the extremity of the urethra tumid and painful; and chordee is urgent, the general antiphlogistic treatment had best be confided in, and astringent injections be postponed until these phenomena have ceased. When injections are had recourse to, the metallic astringents,—as sulphate of zinc, acetate of zinc, acetate of lead, sulphate of copper, sulphate of alumina and potassa, and nitrate of silver, are usually selected.

But whatever hesitancy may exist regarding the use of astringents in the early stages of gonorrhœa, none need be entertained when the inflammatory symptoms have almost wholly disappeared, and a state of *gleet* alone remains. Here, not only astringents, but excitants are needed; and the bougie often removes the disease when every kind of injection has failed. This is partly owing to the instrument coming in contact with the seat of the discharge, however high up the urethra the diseased surface may be,—which cannot easily be effected by injections;—at least, not in the ordinary mode of throwing them up by means of a syringe. They may, however, be directed to any part by a cannula,—an ordinary silver or elastic-gum catheter for example,—which may be passed up until it has nearly reached the seat of the disease, and the fluid of the injection be propelled through it.

Leucorrhœa.—Similar remarks apply to the use of astringent injections in leucorrhœa. Little faith can be placed in the administration of astringents by the mouth, for reasons applicable to hemorrhages from other parts than the alimentary tube,—namely, that the astringent must enter the mass of blood, and can, of course, reach the mucous membrane of the vagina in a state of extreme dilution and admixture only. Leucorrhœa—like other inflammations of mucous membranes—is, sometimes, more inflammatory than at others. It may require the use of powerful antiphlogistics in one case; whilst in another the astringent treatment may be advisable. At times, it is accompanied by considerable remora of fluids in the membrane, and by much relaxation of parts, and it is in these cases chiefly, that mineral astringents, and the astringent vegetable infusions and decoctions are employed. Where the

inflammation and irritation are excessive, soothing topical remedies,—as warm milk and water, flax-seed tea, &c.,—are rather indicated; or, if cold and astringent lotions afford more relief, care must be taken not to render the astringency too marked. In such cases, the solutions of the metallic salts, used in inflammation of the mucous membrane of the urethra, are generally chosen; but where the atony and relaxation above mentioned exist to any great extent, infusions or decoctions of catechu, or of red oak bark, or some other vegetable astringent are generally selected. In every case, care must be taken not to make the lotion too astringent; otherwise, as before seen, the inflammation may be augmented.

Diabetes Mellitus.—In this singular disease of the function of nutrition, characterized by an inordinate discharge of sweet urine, vegetable and mineral astringents, in the ignorance that has prevailed of its pathology, have been largely prescribed; but without any benefit. The disease does not consist simply of a profuse secretion of urine. This is the smallest part of the evil. It is the formation of saccharine matter at the expense of the system, which is the main source of mischief; and this can scarcely be touched by astringents.

Ephidrosis.—Immoderate sweating is rather an unpleasant symptom of certain morbid conditions of the system than a disease itself. One or two singular epidemics, of which ephidrosis was a prominent phenomenon, have occurred from time to time in Europe. The *Sudor Anglicus* or ‘sweating sickness’ was a very severe epidemic disease, which appeared in England in 1486; and recurred at different times until about the middle of the 16th century. It was accompanied by coldness; excessive prostration of strength; palpitation; frequency and irregularity of pulse; and generally terminated favourably or unfavourably in the course of twenty-four hours. The *Suette de Picardie* is another epidemic malady, which has appeared several times in the province of Picardy in France. The principal symptoms were profuse sweats, accompanied by a miliary eruption. The disease recurred in 1821, and has been described at length by M. Rayer, in a work, which he did the author the honour to transmit to him. M. Rayer considers the *Suette miliare* of 1821 to consist of simultaneous inflammation of various tissues; and proposes to class it with variola, rubeola, and scarlatina.

In these two epidemics, the state of the organism appears to have been essentially different. Increased exhalation from the cutaneous surface may, indeed, take place in two opposite conditions of the vascular system. In the one, the vital forces may be exalted; in the other, depressed; and hence the warm, genial perspiration of health, induced by exercise or by excitants of any kind;—and the cold, clammy exudation, which accompanies enfeebled powers, and is the precursor of dissolution.

Phthisis.—In confirmed phthisis, colliquative sweating is one of the accompaniments of hectic fever, and cannot of course be removed,

unless the condition of the lungs, which gives rise to the hectic, can be rectified. As this is impossible, no signal advantage can be derived from the employment of astringents; although the physician is, at times, led to attempt the palliation of an evil—which he cannot remove or prevent—in consequence of the complaints of the sufferer. There is nothing better adapted for this end, than a combination of tincture of opium, and diluted sulphuric acid,—or the *acidum sulphuricum aromaticum*.

Relaxations of parts.—In all relaxations of parts, with which astringent solutions can be made to come into immediate contact, they are the remedial agents, that are clearly indicated; hence, they are employed in *procidentia ani*, and *procidentia vaginæ*, with the best effects;—these pathological conditions being usually dependent upon a state of atony of the parts concerned.

Topical diseases.—Lastly, the surgeon has recourse to astringents in many of the *morbi externi*, that fall under his province. Of their use in ophthalmia, aphthæ, and in erysipelatous and phlegmonous inflammations, the author has already spoken, as well as of the particular morbid states in which their employment seems to be indicated. In chronic ulcers of an indolent character, they are used like excitants to induce a new action in the ulcerated surface; and are often beneficial. As styptics—chemical as well as mechanical—they are likewise employed where the hemorrhage is insufficient to demand the use of the ligature; or where the ligature cannot be easily applied.

Twenty years ago, a styptic was re-introduced into notice in Italy, which astonished the surgical world for a time, but whose operation, like that of many agents equally strongly recommended, has been found to far exceed its powers. This was the "*new hæmastatic*," as it was termed, *Acqua Binelli*, so called after Dr. Fidele Binelli, the inventor. This liquid is perfectly transparent; almost tasteless; having a slightly empyreumatic odour, in which neither salt, earth, alkali, nor acid can be perceived by the senses. The first public trials, to test its efficacy in arresting hemorrhage, were instituted at Turin, in 1797, by order of the government; the results of which were regarded favourable. Soon after this Binelli died, and the secret for making the preparation is said to have died with him; but in the years 1829 and 1830, the successors of Binelli affirmed, that they had found it, and fresh experiments were instituted, and repeated in Germany. Various blood-vessels were divided on animals,—the femoral and carotid arteries and the internal jugular veins; and the cuts were made in every direction, some longitudinally; some obliquely; others completely across, and in all cases the hemorrhage yielded as soon as charpie or lint, steeped in *Acqua Binelli*, was applied and pressed gently against the wound for five or ten minutes. Encouraged by the results of the experiments on animals, its effects were tried on man. *First*. Before the assembled class in Berlin, in the operating theatre, after amputation of a finger, the arteries of which emitted blood very freely. *Secondly*. In the case of a wound of the hand, caused by a cutting instrument, which entered

deeply between the metacarpal bones of the thumb and index finger, and in which the hemorrhage could not be arrested by compression or the tourniquet, without fear of causing gangrene. *Thirdly*. After the removal of an indurated inguinal gland, accompanied by hemorrhage; and, *fourthly*, after amputation of the thigh on account of a scrofulous knee joint, when the blood issued with great force, on the least relaxation of the tourniquet, from the crural, perforating, and other muscular arteries, as well as from the veins. In all these cases, the hemorrhage was speedily and permanently arrested by the application of *Acqua Binelli* without any other aid. It did not cause the least pain on its application, nor did it produce any discoloration on the surface of the wound, or eschar, or any local or general effect of a disagreeable character.

But the experiments of Dr. John Davy have proved, that the boasted *Acqua Binelli* is only another example of the numerous remedial agents, which have given occasion to inferences not confirmed by farther investigations. They completely overthrow the fancied hæmastatic powers ascribed to the liquid by the German and Italian experimenters. "I first examined"—says Dr. Davy,—“into its physical and chemical qualities. It proved of the same specific gravity nearly as distilled water. It was neither acid, alkaline, nor saline. Its odour was not unlike that of coal-gas, not purified, which is lost by boiling. Its taste was rather pungent, not in the slightest degree astringent; in brief, it appeared to be merely water, containing a little volatile oil or naphtha, and was probably prepared by the distillation of water from petroleum, or some kind of tar. I next made trial of it as a styptic. I scratched the back of the hand with a lancet till the blood flowed. The water applied to the scratch rather increased the bleeding than stopped it. The following morning, in shaving, the razor inflicted a slight cut: the *Acqua Binelli* was again applied, and the result was the same. These few and simple trials were made in January 1831, just after I received the water; and they of course convinced me that the thing was an imposition on the public, and deserving of no further investigation. A short time since, my attention was recalled to the subject by a medical practitioner of this island, who had studied at Naples, inviting me with others to witness the effects of a preparation made in imitation of the *Acqua Binelli*, and which he maintained was identical with it in composition and virtues. The experiment he invited us to witness appeared an unobjectionable one, namely,—the partial division of the carotid artery of a goat, the bleeding of which he undertook to stop by means of his fluid. He allowed us to expose the vessel and cut it across; about one-half of the circumference of the artery was divided, and the bleeding was most profuse. He stood ready with compresses moistened with the fluid, which he instantly applied one over the other, and secured them by rolling a bandage about the neck, making moderate pressure on the wounded vessel. A little oozing of blood followed which soon ceased. He said that in three hours the bandage and compresses might be removed, without any renewal of the hemorrhage. Accordingly, at the end of three hours they were removed; but when the last compress was raised, the bleeding broke out as furiously as at

first, and, to save the life of the animal, the artery was secured by ligature. On examining the last compress, a small coagulum of blood was found adhering to it, just the size proper to close the wound in the carotid; thus accounting for the ceasing and renewal of the bleeding. Reflecting on this result, and considering the chemical nature of the fluid employed to moisten the compresses, which appeared analogous to that of *Binelli*, the conclusion I arrived at was obvious—namely, that had the compresses used been moistened merely with common water, the effect would have been the same,—the bleeding would have been stopped; and it also appeared very probable, that, had the compresses been allowed to remain undisturbed, there would have been no renewal of the bleeding.

“To ascertain the truth of these inferences, the following experiments were made. On the same day, February 8th, in the presence of several medical officers, I divided partially, transversely, the carotid artery of two dogs; one small and feeble, the other of moderate size and strong. In each instance the bleeding was most profuse, till compresses dipped in common water had been applied and secured by a bandage, which, as in the case of the goat already given, completely stopped the hemorrhage. The small dog, from the proportionally large quantity of blood which it lost, was very feeble immediately, and appeared to be dying; but it presently rallied, and for several days seemed to be doing well. It unexpectedly died on the 15th, seven days after the infliction of the wound. The bandage during this time had not been touched, and no application had been made. Now, on exposing the neck, the wound was found covered with coagulable lymph discharging pus; and, on dissecting out the artery and eighth nerve contiguous to it, a mass of coagulable lymph appeared lying over the wound in the vessel, extending about half an inch above and below it. This mass of coagulable lymph having been carefully removed, and the artery slit open, the vessel was found quite pervious, not in the least contracted. The wound in the fibro-cellular tissue, or external coat, was closed by a minute portion of dense coagulable lymph. But not so in the middle and inner coats; in these there was a gaping aperture, across which, on minute inspection, two fine threads, apparently of coagulable lymph, (as if the commencement of the healing process,) were observable. The cause of the dog's death was not discovered. The other dog did not appear to suffer from the wound. The bandage and compresses were removed on the 15th February without the occurrence of any bleeding. On the 20th of the same month, the wound in the neck was nearly closed by granulations. The artery was now exposed by incision; and the portion that had been wounded taken out, between two ligatures previously applied. On careful examination of this excised part, it was found free from coagulable lymph; at least there was not the same thickening or tumour from lymph deposited, as in the former case; it was probably absorbed. When the external loose cellular tissue was dissected away, a very minute elevation, about the size of a pin's head, appeared on the site of the wound, the remains of the cicatrix externally. The artery was completely pervious, and not at all contracted where it had been wounded. Slit open for internal

examination, the wound in the inner coat was marked by a red line interrupted by two white spots; there was no gaping; the edges adhered together, excepting at one point; elsewhere the union was complete. The white spots resembled the natural lining membrane; and had the whole wound been similarly healed, I believe it would have been impossible to have traced it.

“The general results of these experiments, (if I may be allowed to speak of so small a number,) are not without interest in application to surgery. They show how a hemorrhage from the wound of a large artery, which by itself would be speedily fatal, may be easily arrested by moderate compression through the means merely of several folds of linen or cotton moistened with water; and they further show how, under this moderate compression, the wound in the artery heals, the vessel remains pervious, and without the formation of an aneurism; and how, after a time, only slight traces of the wound are discoverable. Under this moderate pressure the healing of the wounded artery seems to be very analogous to that of a wounded vein, and apparently by means of the same natural process. Whether similar results could be obtained, were trial made of the same means in the wounds of arteries in the human subject, can only be ascertained positively by judicious experiments. The probability is, that the results would be the same. The analogy is very complete, and some facts well known in surgery accord with it, not to mention the experience of the effects of the *Acqua Binelli*, as certified by men of high respectability.

“It was my intention to have given a selection of the certified cases in favour of the *Acqua Binelli*, brought forward in the pamphlet which is furnished with the water. But on reconsidering them, it appeared a superfluous labour, as the results, (giving them credit for correctness,) however excellent in a curative point of view, are no more than the enlightened surgeon of the present time may readily admit to be owing to water dressings alone, without the aid of pressure,—the majority of instances adduced being examples of gun-shot wounds and contused wounds, from which there was no profuse bleeding, and no necessity, according to the ordinary mode of surgical treatment, for securing wounded vessels. I have laid stress on the effect of the *pressure* afforded by the wet compresses applied in the experiments related, believing that the virtue of the means consists in the pressure,—of course not in the water, excepting so far as it renders the compresses better fitted for adaptation to the wound to produce the degree of resistance requisite to counteract the heart’s impulse in the vessel; and also better fitted to exclude atmospheric air. I would also lay stress on the *moderate* degree of pressure that is produced in the manner described,—allowing the blood to pass through the canal of the artery, and, as before observed, doing little more than resisting the momentum of the blood in its passage from the moving source. The importance of this moderate degree of pressure, which has the effect of reducing as much as possible the wounded artery to the condition of a wounded vein, is, if I do not deceive myself, very considerable. When I have pressed with the fingers forcibly on the compresses applied to the wound, ex-

pecting at the moment to arrest the bleeding, I have been disappointed. The hemorrhage has continued; and it only ceased when the compresses have been secured, and not tightly, by a roller passed around the neck of the animal. And, further, in illustration, I may remark, that I have been equally disappointed in using graduated compresses, insuring considerable pressure on the wound. This means has failed, when general moderate pressure, effected by compresses about two inches long and one wide, succeeded. On considering the comparative circumstances of these two modes of applying compression, therefore, the difference of result is perhaps what might be expected. The severe pressure can hardly arrest the bleeding except by pressing the sides of the vessel together and closing the canal, the accomplishment of which requires a most nice adaptation, and a force which cannot easily be applied with steadiness except by mechanical means, and in situations affording firm support beneath. Should the expectation which I have ventured to form of this method of stopping the bleeding of wounded arteries of a large size in man be realized on trial, I need not point out how very useful it may prove in military surgery,—how very available it will be in the field and in battle, especially in great actions, when, however numerous and well-appointed the medical staff of an army, the number of wounds requiring attention must always exceed the means of affording adequate surgical relief, according to the plan of treating them at present in use, of suppressing hemorrhage by ligature. I have said nothing of the boasted efficacy of the *Acqua Binelli* given internally. I trust it is as little necessary to make any comments on it now-a-days, as on the tar-water of Bishop Berkeley, so very analogous in nature and reputation. Both the one and the other in some cases may be serviceable; but their principal recommendation appears to be, that in doubtful cases they are innocent.”

Dr. Davy's observations have been given at some length, because they contain interesting information, as regards the physiology, pathology and therapeutics of wounded vessels, and convey a useful lesson to the inquirer,—not to deduce inferences from inadequate data, without having investigated every collateral circumstance that may bear upon the question. Were this course pursued, we should not have so many examples of the *experientia falsa* as we are daily doomed to witness. It has been suggested that *Acqua Binelli* may be indebted for its fancied hæmastatic property to creasote in some form; but Dr. Davy's explanation appears all sufficient to account for the phenomena. (For other testimony, in regard to the *Acqua Binelli*, see the author's *New Remedies*, 5th edit., p. 68, Philad. 1846.)

To the same work the author may refer for information in regard to the *Acqua Brocchieri* and other hæmastatic waters, on which much was said in this country and elsewhere, a few years ago, but to which the unbiassed observer is compelled to consider the remarks made on the *Acqua Binelli* to be equally applicable. Neither the *Acqua Brocchieri*, nor the *Eau hémastatique de Tisserand*;—nor—as will be seen hereafter—the *Ergotin* or *Extrait hémastatique de Bonjean*, is possessed of the hæmastatic virtues that have been assigned to them.

Such is a general view of the *modus operandi* of astringents in the principal diseased conditions of the frame. When properly employed, they are by no means the least useful of our medicinal agents.

SPECIAL ASTRINGENTS.

I. *Vegetable Astringents.*

1. ACIDUM TANNICUM.—TANNIC ACID, TANNIN.

Tannic acid or tannin—as before remarked—is the great active principle of vegetable astringents. It became desirable, consequently, to separate it, in order that it might be administered in a state of purity. Different processes have been recommended for this purpose, but that of M. Pelouze appears to have superseded others, and has been adopted in the last edition of the *Pharmacopœia* of the United States, (1842.) It consists in extracting it from *galls* by *ether*, by the process of displacement.

When thus prepared, tannic acid is of a yellowish white colour; of a strongly astringent taste; and is soluble in water, alcohol and ether, reddening litmus paper, and forming salts with bases.

Tannic acid is a very powerful astringent, and may be employed in all cases in which astringents are considered necessary. One advantage is the minuteness of the dose in which it can be given. It has been much employed by the Italian physicians especially, both in external and internal hemorrhages. When applied to the mucous membranes, it appeared to Cavarra to cause such a condensation and contraction of tissue, that the glands or follicles could no longer afford passage for the mucus which they secreted. It has been used in discharges from mucous membranes; and in the colliquate sweats of hectic fever.

The dose is from a quarter of a grain to two or three grains, generally given in the form of pill. It may, also, be used as an enema in chronic diarrhœa and dysentery, or in prolapsus ani; and has been injected into the urethra by M. Ricord, in cases of blennorrhœa virulenta, in the quantity of ℥ij of *tannic acid* to ℥viiij of *aromatic wine* of the French *Codex*, or of red wine; and in a less proportion in cases of chronic blennorrhœa or gleet. In blennorrhœa of the female, he doubles the quantity of *tannic acid*; and even carries it still farther.

Mr. Druitt is of opinion, that in any case in which a vegetable astringent is indicated, tannic acid should have the preference. A simple solution of it in distilled water, he says, is much more easily and quickly prepared, as well as much more elegant, than the ordinary decoctions or infusions of oak bark, catechu, &c. Moreover, it may be prepared of uniform strength, and free from foreign inert matter; and is not liable to decompose quickly. It has, in fact, he considers, all the advantages

which the other simple vegetable principles have over crude preparations from the herbs or extracts in which they are contained. In sore nipples, Mr. Druitt has found it invaluable. He employs it in solution—five grains to the fluidounce of distilled water—on lint covered with oiled silk. He has also found it of great service in toothache. The gum around the tooth is first scarified with a fine lancet, and then a little cotton wool, embued with a solution of a scruple of tannic acid, and five grains of mastich in two drachms of ether, must be put into the cavity, “and if the ache is to be cured at all, this plan will put an end to it in nine cases out of ten.”

2. ACIDUM GALLICUM.—GALLIC ACID.

This acid is by no means so abundant as the tannic, and appears to be produced by an alteration of the latter. A solution of tannic acid in water exposed to the air gradually absorbs oxygen, and deposits crystals of gallic acid, formed by the destruction of tannic acid. To prepare gallic acid, a strong extract of *gallnuts* in cold water may be precipitated in the cold by *sulphuric acid*; the thick mass be mixed with *dilute sulphuric acid*, be expressed whilst still humid, and introduced in this state into a mixture of *sulphuric acid* with two parts of *water* at the boiling temperature. The liquid is boiled for some minutes, and then allowed to cool: crystals of gallic acid are deposited, which may be purified by crystallizing again from water, converting the new product—which is still coloured—by means of *acetate of lead*, into an insoluble gallate of lead, which is washed, then diffused through water, and decomposed by a stream of *sulphuretted hydrogen gas*: the sulphuret of lead, thus formed, assists in carrying down the colouring matter.

Gallic acid is in thin, silky needles; requires 100 parts of cold water to dissolve it, and three of boiling water. It is very soluble in alcohol, and, to a slight extent in ether. The solution in water has an acid and astringent taste, and is gradually decomposed by keeping.

It has been recently much extolled as a valuable astringent. It has already been remarked (p.107) that the successful operation of Ruspini's styptic in hæmaturia has been ascribed to it. In some cases of menorrhagia, this acid has been employed by Professor Simpson, and by Dr. Stevenson of Edinburgh, with the most successful results. The former gave it during the intervals, as well as during the discharge, in doses of from 10 to 20 grains in the day, made into pills; and it appeared to him to have the advantage over most other anti-hemorrhagic medicines, that it had no constipating action. He was first induced to prescribe it from finding a case of very obstinate menorrhagia get well under the use of Ruspini's styptic. Professor Simpson suggests, whether the anti-hemorrhagic properties of some others of the astringent drugs may not be dependent upon the gallic acid as much as, or even more than, upon the tannic acid which they contain,—or upon the tannic acid becoming changed into gallic acid within the body. Its value in uterine hemor-

rhage and hæmaturia has been confirmed by others, and Messrs. Ballard and Garrod declare it to be one of the most powerful astringents that the art of chemistry has derived from the vegetable kingdom; and that a tolerably extensive experience enables them to declare it to be an invaluable remedy in most forms of passive hemorrhages and fluxes. They affirm, however, that if its use be prolonged beyond two or three days, it manifests some constipating tendency. This is opposed to the observation of Professor Simpson; but is probably accurate. They affirm, moreover, that the excessive sweats and expectoration of phthisis; and the copious expectoration of chronic bronchitis are much influenced by it; which is less probable, as these phenomena are dependent upon pathological conditions of which they can only be regarded as expressions. They found the acid highly useful as an injection in leucorrhœa.

The ordinary dose of gallic acid is from two grains to five or more in the form of pill. An injection may consist of from a scruple to a drachm to the pint of water.

3. CATECHU.

Catechu is an extract prepared from the wood of *Acacia catechu*, *Mimosa catechu*; SEX.

SYST. Polygamia Monœcia; NAT. ORD. Leguminosæ, which is indigenous in various parts of the East Indies, and is now common in Jamaica. (Pereira.)

The Edinburgh College considers it to be not only the extract of the wood of *Acacia catechu*; but of the kernels of *Areca catechu*, *Betel nut tree*, *Catechu palm*; SEX. SYST. Monœcia Hexandria; NAT. ORD. Palmæ; which inhabits most of the Indian continent and islands; and of the leaves of *Uncaria gambir* or *Nauclea gambir*; SEX. SYST. Pentandria Monogynia; NAT. ORD. Rubiaceæ,—

Cinchonaceæ, (Lindley,) which is a native of Malacca, Sumatra, Prince of Wales Island, Cochinchina, and other parts of Eastern Asia. It would appear, however, that the extract obtained from the two last sources is rarely, or never, seen in European or American commerce. Catechu is supposed, also, to be obtained from *Butea frondosa* or *Dhak tree*, of the East Indies; SEX. SYST. Diadelphia Decandria; NAT. ORD. Leguminosæ.

The number of catechus described by pharmacologists is considerable. At least as many as thirteen varieties have been admitted; but, although

Fig. 144.



Acacia catechu.

1. Stamens. 2. Legume.

these may be of commercial and pharmaceutical interest, they are of less moment to the therapist. They are described at length by some of the best modern pharmacologists. In this country, we are not troubled with varieties.

The drug is procured either directly from Calcutta or from London.

Catechu, formerly termed *Terra Japonica*—as met with in the shops—is in masses of different shapes and sizes; of a rusty brown colour externally, and internally of a colour varying from a pale reddish to a dark liver. It is devoid of smell, and has an astringent bitter taste. That which is preferred in this market is of a dark colour, and easily broken into small angular fragments, with a smooth, glossy surface, bearing some resemblance to kino. (Wood & Bache.) It is often mixed with various impurities; and, with the exception of these, is soluble in water. Small, successive portions of cold water remove chiefly the astringent part; and a much larger proportion of water is required to dissolve the remainder, which is principally an extractive resinoid matter with acid properties. (Christison.) Hot water dissolves both principles; but if the infusion be made very strong, a reddish extractive matter is deposited on cooling. Alcohol and diluted alcohol dissolve it more readily than water. When subjected to analysis, it is found to consist of about 50 per cent. of tannic acid, peculiar extractive mucilage, and insoluble matter.

This is one of the most powerful of the vegetable astringents; and is as well adapted for cases in which such agents are demanded as any article belonging to the class. In atonic conditions of the mucous membrane of the mouth and fauces; in the chronic forms of diarrhœa and dysentery; in asthenic hemorrhages; and in chronic mucous discharges from the genito-urinary organs, it has been prescribed with much success. It has also been used as a wash, in the form of infusion; and in that of ointment to atonic ulcers, in which an astringent is indicated. A small piece of it, held in the mouth, and allowed to dissolve in the saliva, has been beneficial in relaxation of the uvula; and it has been added to other substances, as to powdered cinchona, to form a dentrifice for spongy gums.

The dose in powder is from gr. x to ʒj, which may be given in bolus, or rubbed up with sugar, gum arabic and water.

INFUSUM CATECHU COMPOSITUM, COMPOUND INFUSION OF CATECHU. (*Catechu* pulv. ʒss; *Cinnam.* cont. ʒj; *Aquæ bullient.* Oj.) Cinnamon adds aromatic virtues to catechu; and the infusion is much used in chronic discharges from the mucous membranes, especially of the alimentary canal,—at times alone; at others, associated with opium. It ought not to be given along with preparations of iron. The dose is f.ʒj to f.ʒiij, repeated according to circumstances.

TINCTURA CATECHU, TINCTURE OF CATECHU. (*Catechu* ʒiij; *Cinnam.* cont. ʒij; *Alcohol. dilut.* Oij.) The same remarks apply to the composition of this tincture as to that of the infusion. It is rarely given alone, the alcohol being so often an objection; but is often added to

chalk mixture, and occasionally to the infusion of catechu. Its dose is from f.ʒj to f.ʒiij, in sugared water, or in Port wine and water.

4. KINO.

In the Pharmacopœia of the United States, kino is said to be an extract obtained from an uncertain plant; whilst in the London Pharmacopœia it is assigned to *Pterocarpus erinaceus*, *Hedgehog Pterocarpus*: SEX. SYST. Diadelphia Decandria; NAT. ORD. Leguminosæ, a tree which inhabits the woods on the Gambia and Senegal. The Edinburgh College assigns it to the same, and to other undetermined genera and species.

Different varieties are described in pharmacological works. According to Dr. Pereira, two substances are met with in English commerce

Fig. 145.



Pterocarpus marsupium.

under the name,—the one called *Botany Bay kino*, which is the inspissated juice of *Eucalyptus resinifera*; the other, apparently an extract imported from Bombay and Tellicherry, and which he terms *East India kino*. The latter is presumed to be the substance referred to in the Pharmacopœias, as it is always regarded in commerce as *genuine gum kino*. Ten years ago, (1839) it was affirmed by Dr. Gibson of the Bombay service, that this kino is the produce of *Pterocarpus marsupium*; and the subsequent observations of Drs. Royle, Pereira and Wright, according to Dr. Christison, have established the fact, that all the kino of British commerce is prepared at Anjarakandy, near Tellicherry in Malabar, from that tree, which is one of the most magnificent in the forests of India. When longitudinal incisions are made into it, a great quantity of red juice exudes, which, on being simply dried in the sun, cracks into little irregular angular masses constituting the kino of the shops.

As met with in the shops, kino is in small, angular, shining fragments ; of a dark brown or reddish brown colour, affording a powder which is of a lighter hue. It is brittle, but softens in the mouth ; and colours the saliva red. It is devoid of smell, and has a very astringent taste. Cold water dissolves a portion of it, and hot water a larger quantity ; whilst alcohol dissolves the greater part. When subjected to analysis, it is found to consist of tannic acid, and peculiar extractive, 75 per cent. ; red gum ; and insoluble matter.

Kino is closely allied, both in its chemical and medical virtues, to catechu, with which it has, indeed, been considered by some to be identical. It is given in the same affections.

The dose of the powder is from ten to thirty grains. An *infusion* made by pouring eight fluid ounces of boiling water on two drachms of kino, may be given under the same circumstances as *Infusum catechu compositum*. The dose of this may be f.℥j to f.℥iij. A *TINCTURE* (*Kino*, pulv. ℥iiss ; *Alcohol*. Oij. imperial measure) is officinal in the London Pharmacopœia. It becomes gelatinous, however, when kept ; unless when prepared by displacement. It is used under the same circumstances, and in the same doses as *Tinctura catechu*.

5. GALLA.—GALLS.

Galls are morbid excrescences on *Quercus Infectoria* ; SEX. SYST. Monœcia Polyandria ; NAT. ORD. Cupuliferae ; which abounds throughout Asia Minor, and especially along the coasts of the Mediterranean. The young twigs of the plant are liable to be punctured by an insect of the *Gallicolæ* or *Diplolepariæ* tribe, called *Cynips gallæ tinctoriæ*, *C. quercusfolii*, or *Diplolepis gallæ tinctoriæ*, which deposits its eggs, and gives rise to so much irritation, that the nutrition of the part becomes modified, and a tumour or excrescence is formed which is termed a *gall*. In the interior of this, the young insect finds food during its transformation ; and ultimately attains the state of fly, when it penetrates the gall and escapes. This usually occurs about the end of July ; but, as the galls are of finest quality just before the escape of the insect, they are generally gathered about the middle of July. Those that are exported from Aleppo—hence called *Aleppo galls*—are the best. Those from Smyrna contain a larger admixture of white galls ; and are, therefore, less prized. Others, brought from India, termed *East India galls*, closely resemble those from the Mediterranean. They are said to grow in Persia, and to be taken thence by the Arab merchants to Calcutta. (Ainslie). Large quantities of these were introduced into the United States some years ago. The galls of Asia Minor and Syria are chiefly brought to this country from the ports of Smyrna and Trieste. (Wood & Bache.) In English commerce, three kinds of galls are distinguished—the *black* or *blue*, the *green*, and the *white* ; no essential difference, however, exists between the first two. They are the best, and are gathered before the insect has issued ; whilst the white galls are collected for the most part after the insect has escaped, and hence they are found to be perforated with a circular hole. They are all devoid of

odour; and have a styptic and powerfully astringent taste. The white kind, however, possesses these qualities in an inferior degree.

They yield their astringent properties to water, alcohol and ether. Water seems to be the best menstruum; and, next to it, dilute alcohol. When analyzed by Sir Humphry Davy they were found to consist of 26 per cent. of tannic acid; 63 of lignin; 6.2 of gallic acid; 2.4 of gum, united with insoluble tannin; and 2.4 of saline matters. It has been found, however, that the tannic acid is contained in larger quantity than was estimated by Sir Humphry,—more recent and exact processes showing, that it amounts to 40 or even 60 per cent. (Christison.)

Galls are an excellent and powerful astringent, possessing at least as much tannic acid as catechu; but they are not by any means so often prescribed internally. They may be used, however, in the same affections. An *infusion* prepared of $\mathfrak{z}\text{iv}$ of the *galls* to $\text{f.}\mathfrak{z}\text{vj}$ or $\text{f.}\mathfrak{z}\text{viij}$ of *boiling water* may be given internally in the dose of $\text{f.}\mathfrak{z}\text{ss}$ to $\text{f.}\mathfrak{z}\text{ij}$; but it is more frequently used as an astringent wash, and is occasionally prescribed as an injection in chronic diarrhœa and dysentery, and in leucorrhœa,—or wherever a topical astringent is needed. The dose of the powder, which is rarely prescribed, is from ten to twenty grains.

TINCTURA GALLÆ, TINCTURE OF GALLS. (*Gall.* cont. $\mathfrak{z}\text{iv}$; *Alcohol.* dilut. Oij. Prepared either by maceration or by displacement.) This is a powerfully astringent preparation; and when diluted with water, makes a good wash or gargle. It is rarely given internally; its chief use, indeed, is as a chemical test.

UNGUENTUM GALLÆ, OINTMENT OF GALLS. (*Gall.* pulv. $\mathfrak{z}\text{j}$; *Adipis* $\mathfrak{z}\text{vij}$.) This has been a favourite application with many practitioners in hemorrhoids, after the inflammatory stage has passed away. Some have employed it in the same cases much stronger,—the ointment being formed of equal parts of powdered galls and lard or butter. The London and Edinburgh Colleges have an **UNGUENTUM GALLÆ COMPOSITUM**, formed of *Galls*, in very fine powder, $\mathfrak{z}\text{ij}$; *Opium* powdered, $\mathfrak{z}\text{j}$; *Lard*, $\mathfrak{z}\text{j}$. The author has often used this ointment in hemorrhoidal affections with marked advantage.

6. KRAMERIA.—RHATANY.

The root of *Krameria Triandra*, *Rhatany*; SEX. SYST. Tetrandria Monogynia; NAT. ORD. Polygalææ,—Krameriaceæ, (Lindley,) is official in all the Pharmacopœias of Great Britain and in that of the United States. The plant inhabits the mountainous parts of Peru, especially in the district of Huanuco and other localities in which cinchona flourishes. According to Tschudi, most of the Rhatany which is exported to Europe is obtained in the southern provinces of Peru, particularly in Arica and Islay.

As met with in the shops, it consists of a short root-stock, from half

an inch to two inches in diameter; and of numerous roots proper, which

Fig. 146.



Krameria triandra.

are simple or branched, one or two feet in length, and varying in thickness from that of a writing quill to that of the thumb. The bark is of a dark brownish-red colour, wrinkled and warty on the root-stock, but smoother on the branches. The central woody portion is of a yellowish or pale red colour. As the bark contains the largest amount of astringent matter, the smaller branches are preferred. It is devoid of smell, and of a very bitter astringent taste. The virtues of the root are readily yielded to water and to alcohol.

When subjected to analysis, it has been found to contain about 40 per cent.

of tannic acid; and, according to M. Peschier, a peculiar acid, called by him *kramerin*; the properties of which are but little known; and to which, as well as to the tannic acid, the astringency has been ascribed.

Rhatany is an excellent astringent, well adapted for all cases in which that class of remedies is needed. In chronic diarrhœa and dysentery, it is frequently administered, both by the mouth and rectum. It is sometimes used as a tooth-powder, mixed with equal parts of orris root and charcoal; and a tincture is not unfrequently made by the dentists as an astringent tooth-wash in looseness of the gums.

The dose of the powdered root is from gr. x to ʒss; but it is not so often prescribed as the infusion or extract.

A *tincture* may be formed by digesting three ounces of the *bruised root* in a pint of *proof spirit*; and a *compound tincture* is formed by adding to this one or two ounces of *cinnamon*, or half an ounce of *Virginia snakeroot*. Both these are astringent stomachics. A *syrup of rhatany* is sometimes prepared by making a saturated cold infusion, and adding sufficient sugar. A tea-spoonful of this is a dose in the chronic profluvia of children.

INFUSUM KRAMERIE, INFUSION OF RHATANY. (*Krameria* contus. ʒj; *Aquæ bullient.* Oj.) The dose of this is f.ʒj. to f.ʒij.

TINCTURA KRAMERIE, TINCTURE OF RHATANY. (*Kramer.* pulv. ʒvj; *Alcohol. dilut.* Oij; made by maceration or by displacement.) This tinc-

ture may be added to astringent infusions or mixtures, or may be taken alone mixed with water. Dose f.ʒj to f.ʒiij.

EXTRACTUM KRAMERLÆ, EXTRACT OF RHAT'ANY. This is prepared by evaporating an infusion made by displacement. It is also occasionally imported, ready made, from South America. The dose is gr. x to ʒj.

SYRUPUS KRAMERLÆ, SYRUP OF RHAT'ANY. (*Extract. kramer. ʒij; Sacchar. ʒiiss; Aquæ Oj.*) This is a pleasant astringent syrup in the diseases of childhood, in which it may be given in the dose of a tea-spoonful. It may also be added to astringent mixtures.

7. QUERCUS ALBA.—WHITE OAK BARK; AND

8. QUERCUS TINCTORIA.—BLACK OAK BARK.

Of the numerous oaks,—SEX. SYST. Monœcia Polyandria; NAT. ORD. Cupuliferæ, (Lindley,)—that flourish in our forests, these two are alone officinal; and the former is conceived to resemble most *Quercus pedunculata*, Common British Oak.

White Oak is met with in every part of the United States, but is more common in the Middle states. Its bark is of a whitish colour, which distinguishes it from the other species. As we meet with it deprived of its epidermis, it is of a light brown colour, of a coarse texture, and not readily reduced to powder. Its taste is astringent and bitterish. It imparts its properties to water and to alcohol. These are mainly dependent upon tannic and gallic acids.

BLACK OAK has a furrowed bark of a dark colour, which is more bitter than the bark of the white oak: it is distinguished by its staining the saliva yellow, and is used, under the name of *Quercitron*, to dye silken and woollen fabrics yellow. It contains a considerable amount of tannic acid.

Fig. 147.



Quercus pedunculata.

a. Male catkins. b. Stamens. c. Female involucre and stigmas. d. Young fruit. e. The same magnified. f. A cotyledon with the radicle.

Oak bark is a powerful astringent, and is adapted for all cases in which astringents are needed; yet it is rarely given internally. In decoction, it is often employed externally, both by the profession and the laity, in relaxation of parts—as in elongation of the uvula, relaxed sore throat, prolapsus ani, &c., and in chronic discharges from the bowels and vagina. It is said to have been used with advantage in certain diseases of childhood,—as a bath, for example, in marasmus, scrofula, cholera infantum, &c., where the stomach would not receive tonic and astringent remedies kindly; but it is not easy to see how any considerable benefit could be derived from it. It has even been affirmed to cure intermittents in children, when administered in this manner. It has also been used beneficially, as a wash, in flabby ill-conditioned ulcers. Like alum, finely powdered bark has been inhaled in cases of phthisis pulmonalis, and especially in *laryngeal phthisis*. The dose of the powder is from \mathfrak{zss} to \mathfrak{zj} ; but it is scarcely ever given in this form. The bark of the white oak is always preferred as an internal remedy, in consequence of that of the black oak seeming to irritate the bowels.

DECOC'TUM QUERCUS ALBÆ, DECOCTION OF WHITE OAK BARK. (*Querc. alb. contus.* \mathfrak{zj} ; *Aquæ Oiss*; boiled to a pint.) The dose of this is $\mathfrak{f.}\mathfrak{z}\mathfrak{i}\mathfrak{j}$ to $\mathfrak{f.}\mathfrak{z}\mathfrak{i}\mathfrak{v}$; but it is rarely used except as an injection or lotion.

9. HÆMATOXYLON —LOGWOOD.

Logwood, Campeachy Wood, is the wood of *Hæmatoxylon Campechianum*; SEX. SYST. Decandria Monogynia; NAT. ORD. Leguminosæ; a tree, which is indigenous in Central America; and grows wild in Jamaica and other West India islands.

Logwood, as an article employed by dyers, is well known in commerce. It is imported in billets, the bark and white sap-wood being

Fig. 143.



Hæmatoxylon campechianum.

1. Style. 2. Legume.

chipped off, and the inner wood or duramen sent abroad. This is of a deep red colour, but it becomes dark by exposure to the air, and or a blackish brown colour. In the shops, it is kept in chips, or rasped into coarse powder. It has a peculiar, rather agreeable smell; and a sweetish, astringent, and subsequently bitterish taste. When chewed, it colours the saliva violet. The colouring matter is extracted by both water and alcohol, so as to form deep purple solutions. When subjected to analysis, it has been found to

contain volatile oil; a red crystalline substance of a slightly bitter, acrid and astringent taste, called *hæmatin* or *hæmatoxylin*; a fatty or resinous matter; a brown substance containing tannin; glutinous matter; acetic acid; woody fibre, and various salts.

It is a gentle astringent and tonic; and is prescribed occasionally in chronic diarrhœa and dysentery, and other profluvia in which a mild astringent is indicated. It is often given in cholera infantum after the active stage has passed away. It is always administered in one or other of the following officinal preparations.

DECOC'TUM HÆMATOXYLI, DECOCTION OF LOGWOOD. (*Hæmatoxyl.* ʒj; *Aquæ Oij*—boiled to a pint.) The London and Dublin Colleges add a drachm of *Pulv. Cinnamom.* towards the end of the boiling. The dose of this is f.ʒj. to f.ʒij to adults; and f.ʒss to children.

EXTRACTUM HÆMATOXYLI, EXTRACT OF LOGWOOD. (The decoction evaporated.) This extract appears to possess all the virtues of the wood. It is given in the dose of gr. x to ʒss in solution. When made into pills, and kept for any length of time, it becomes so hard as to pass, at times, through the bowels undissolved.

10. TORMENTIL'LA.—TOR'MENTIL.

Tormentil is the root of *Potentilla Tormentilla*, *Tormentilla erecta*, *Common tormentil* or *Septfoil*; SEX. SYST. Icosandria Polygynia; NAT. ORD. Rosaceæ;—a small perennial plant common throughout Europe.

The root—which is officinal in the secondary list of the Pharmacopœia of the United States—as met with in the shops, is of very irregular shape; generally of about the thickness of the first joint of the forefinger. Its colour is deep brownish-red externally, and flesh-red within. It has a slightly aromatic odour, and a very astringent taste; and yields its virtues to water and to alcohol. When subjected to analysis, it has been found to contain a trace of volatile oil; 17.4 per cent. of tannin; 20 of colouring matter; about 28 of gum; and 7.70 of extractive.

Tormentil is a powerful astringent,—one of the most so of the class; yet it is not much used, although applicable to all cases in which astringents are needed. Its dose, in powder, is from ʒss to ʒj; but it is more frequently prescribed in *decoction*, (*Tormentil.* ʒij; *Aquæ Oiss.* Boil to a pint. Dose, f.ʒj to f.ʒij, repeated three or four times a day.)

11. UVA URSI.

The general and medical properties of uva ursi are described under ANTILITHICS, (Vol. i., p. 304,) and it is there stated, that all its medicinal agency is probably as a tonic and astringent. It is unquestionably a good astringent, and is adapted for all the cases in which the other vegetable astringents appear to be required; but does not seem to pos-

sess any peculiar properties, or superior efficacy. It is in chronic cystirrhœa, that it has been most celebrated; and its use has been suggested in chronic bronchitis. The dose of the powder is from \mathfrak{Dj} to \mathfrak{Zj} ; but it is more generally given in the form of the

DECOC'TUM UVÆ URSL, (Vol. i. p. 305.) The dose of this is from $\mathfrak{f.3j}$ to $\mathfrak{f.3ij}$ three or four times a day.

12. GERANIUM.—CRANESBILL.

This is the root of *Geranium maculatum*; SEX. SYST. Monadelphia

Fig. 149.



Geranium maculatum.

Decandria; NAT. ORD. Geraniaceæ; a plant, which is indigenous throughout the United States, flowering from May to July. The root is officinal, and is collected in autumn. This, when dried, is in pieces from one to three inches in length, and from a quarter to half an inch in thickness; somewhat flattened, twisted, wrinkled, tuberculated, and beset with slender fibres; of an amber brown colour externally; internally of a reddish gray. It is a pure astringent; its active constituent being tannic acid. It yields its virtues to water and to alcohol.

Geranium is used in the same cases as other astringents; and, owing to its being devoid of bitterness, or other disagreeable flavour, it is adapted for infants, or for adults whose stomachs are delicate. It is sometimes used as an astringent injection in chronic diarrhœa and dysentery, leucorrhœa, &c., and as a wash in mercurial ptyalism, and to indolent ulcers. The dose of the powder is gr. xx to \mathfrak{Zss} ; but

it is rarely given. It is most commonly prescribed in *decoction*, (*Geran. zj*; *Aquæ Oiss*; coque ad \mathfrak{Oj} . Dose, $\mathfrak{f.3j}$ to $\mathfrak{f.3ij}$) It is occasionally given boiled in milk to children.

13. GRANA/TI FRUCTUS CORTEX.—POME/GRANATE RIND.

This is the rind of the fruit of *Punica granatum*, already referred to. (Vol. i. 219.) It is met with in the shops, in irregular, arched, dry, brittle pieces, which are devoid of odour, very astringent and slightly bitter; of a brown colour externally, and yellow within. It contains about 19 per cent. of tannic acid.

Pomegranate rind has been used as an astringent, chiefly in the form of decoction,—(*Granat. fruct. cort.* ℥ij; *Aquæ destillat.* Oiss; boil to a pint. Dose, f.℥j;)—in chronic diarrhœa and dysentery; and in the colliquative sweats of hectic fever. It has, likewise, been prescribed as an astringent injection in leucorrhœa; as a gargle in relaxed sore throat, and as a wash in loose flabby ulcers,—in the very cases in which astringents in general are indicated,—but it is not much used on this side the Atlantic. The powdered rind has been given in the dose of gr. xx. to ℥ss and more.

14. ROSA GAL/LICA.—RED ROSES.

The petals of *Rosa Gallica*,—red, French or Provins rose, SEX. SYST. Icosandria Polygynia; NAT. ORD. Rosaceæ—a native of the south of Europe, but introduced into the gardens of the United States—is extensively cultivated for medicinal purposes. The petals are gathered before the flower has blown; are separated from their white claws or heels, and dried: they have a velvety appearance; purplish red colour, and bitterish and astringent taste. Their chief constituents, for which they are valued in medicine, are tannic and gallic acids, and colouring matter.

Red roses were, at one time, more employed in medicine than at present. They are more largely used, too, in Great Britain than in this country. Their astringent powers are certainly slight; but, owing to their colour, which they impart readily to water, they form elegant vehicles for the administration of other remedies. Hence, the infusion of roses, although astringent, is a common vehicle for sulphate of magnesia, which is a cathartic.

INFUSUM ROSÆ COMPOSITUM, COMPOUND INFUSION OF ROSES. (*Rosæ Gallic.* ℥ss; *Aquæ bullient.* Oiss; *Acid. sulphuric. dilut.* f.℥iij; *Sacchar.* ℥iss.)

The astringency of the red rose is imparted to the water; but the main agency is that of the sulphuric acid. As above remarked, it is used, especially in Great Britain, as a vehicle for sulphate of magnesia, the taste of which it partly covers. Sulphate of quinia may, likewise, be given in it,—the sulphuric acid dissolving the sulphate, and, at the same time, preventing the tannic acid of the roses from precipitating the quinia. Like sulphuric acid itself, it may be taken in hemorrhages that require the use of astringents, and in the colliquative sweats of hectic. It is also used occasionally as a gargle, associated with alum, tincture of capsicum, &c. The dose is from f.℥j to f.℥iij and more.

CONFECTIO ROSÆ, CONFECTION OF ROSES, *Conserve of Roses.* (*Ros. Gallic.* pulv. ℥iv; *Sacchar.* pulv. ℥xxx; *Mel. despumat.* ℥vj; *Aquæ*

rosæ f. ʒviij.) This confection is slightly astringent; but it is now rarely employed excepting as an agent in the formation of pills of active remedies, as calomel, sulphate of quinia, &c. Rubbed up with syrup, almond or olive oil, and dilute sulphuric acid, it forms a linctus, which is an excellent demulcent expectorant where such is needed. (See *OLEUM AMYGDALÆ*, Vol. i. 244.) It enters into the composition of the *Pilulæ hydragryri* of the pharmacopœias.

MEL ROSÆ, HONEY OF ROSES. (*Rosæ Gallic.* ʒij; *Mel. despumat.* Oij; *Aquæ bullient.* Oiss, reduced to specific gravity 1.32 by evaporation.) This is a very old remedy, employed in sore throat, and ulcerations of the lining membrane of the mouth. It is a mild astringent, and is occasionally used as a vehicle for more active applications. It is sometimes added to astringent gargles.

15. MONESIA.

It is only of late years, that this substance has been known in this country. It was introduced from France with high encomiums from several distinguished physicians and *pharmaciens* of Paris. It is imported into France from South America in cakes or loaves weighing upwards of twenty pounds, which consist of an extract, prepared in South America from the bark of a tree, whose botanical name is unknown. The bark is said to be called, by some travellers, *Goharem*, and by others, *Baranhem*; and the botanists who have examined it in South America, think that it is derived from a *Chrysophyllum*,—*Ch. glycyphlœum*, a tree of middling size, which grows in the forests near Rio Janeiro and elsewhere in Brazil. The bark is smooth and grayish, like that of the plane tree, except that it is much thicker: its sweet taste, too, contrasts greatly with the bitterness of the thin laminæ of the plane tree.

Monesia—the extract—is of a deep brown colour; very soluble in water; and of a taste at first like liquorice, but soon becoming astringent; and leaving behind a well marked and enduring acrid impression, which is experienced especially in the tonsils. When subjected to analysis by M. Persoz, it was found to contain tannic acid, rendering iron blue, 52 per cent.; gum or mucilage, 10 per cent.; sweet matter, 36 per cent. The bark and extract of monesia resemble those of *Quillaia Saponaria*; but they are sensibly different.

Its action on the economy is that of an excitant and astringent, and as such it may be adapted for many pathological conditions in which agencies of the kind are indicated. It has accordingly been prescribed in various profluvia of an atonic character,—in chronic bronchitis, and bronchorrhœa; chronic diarrhœa and dysentery; leucorrhœa; blennorrhœa; and in asthenic hemorrhages—hæmoptysis, metrorrhagia, &c.

The powdered extract, or an ointment made of it, has been applied to ulcers of a flabby and unhealthy character; and, like every new substance brought forward with lofty pretensions, it has been employed in affections of a heterogeneous character. It is unquestionably entitled to attention as an astringent; but, already, it has almost passed into disuse.

Monesia is generally given in pills, in the quantity of from 12 to 40

grains in the twenty-four hours,—the medium dose being 15 or 20 grains taken at twice or thrice. *Syrup of Monesia*, which is adapted for children, may be made of six grains to the ounce of simple syrup. *Tincture of Monesia*, (*Mones. gr. xxxij*; *Alcohol. dilut. f. ʒj*;) may be given in the dose of f.ʒj to f.ʒij in any bitter or astringent infusion. It may also be prescribed as an injection in the quantity of f.ʒj to f.ʒiiss to six fluid-ounces of water. An *Ointment of Monesia*, to be applied to ulcers, may be composed of ʒj of *Monesia* to ʒvij of *Lard* or *Simple ointment*.

16. MATICO.

At the meeting of the Provincial Medical and Surgical Association, held at York in August 1841, Dr. Jeffreys, of Liverpool, introduced to the profession an herb called *Matico*, used in South America as a styptic; a short account of which appeared in the London *Lancet* for Jan. 1839. Since its introduction into England, it has been frequently used, especially as a styptic; and often with apparent success. In diseases of the mucous membranes and in hemorrhages it has been prescribed internally with advantage. So long ago as 1834, the author's friend, Dr. Ruschenberger, of the Navy, brought a specimen from South America to the United States. It is there called *Yerba del Soldado*, *Soldier's weed*. In Peru, according to a statement kindly furnished the author by Dr. Ruschenberger, it has a popular reputation of being a wonderfully powerful styptic; and it is said, that soldiers, on going to battle, carry with them a supply to stanch blood when they receive wounds. The leaf is moistened in the mouth, and then applied.

Fig. 150.



Artanthe elongata.

Matico is *Artanthe elongata*, *Piper angustifolium* of Ruiz and Pavon. It is said to contain resin and volatile oil; but its exact chemical constituents have not been determined. The specimens examined by the author had certainly no marked sensible properties.

It is chiefly given in INFUSION of one ounce of the *leaves* to a pint of

boiling water; of which a fluidounce and a half is a dose;—and in **TINCTURE**—two ounces and a half of the *leaves* to a pint of *dilute alcohol*; of which the dose is from one to three fluidrachms, two or three times a day. Both solutions may be used as external astringents; or, to stop hemorrhage, the inner side of the leaf may be pressed upon the bleeding vessel. As the author has remarked elsewhere, however, the difficulty of establishing the action of styptics is considerable, as is sufficiently exemplified in the history of the Acqua Binelli and the Acqua Brocchieri, (p. 116). The same difficulty exists in regard to the determination of its powers as an internal astringent. After the discharge of an uncertain amount of blood, hemorrhage generally ceases spontaneously; and hence any article, that may have been administered, may acquire a hæmastatic reputation. This probably is the history of the employment of chloride of sodium to check the flow of blood in hæmoptysis. Doubtless, however, matico is worthy of more extensive trials, although its sensible properties, taken alone, would not encourage us to place more faith in it than in the overrated hæmastatic ‘waters’ referred to. (*New Remedies*, 5th edit. p. 436, Philad. 1846.)

17. MATIAS or MALAMBO.

Malambo bark, the source of which has not been positively deter-

Fig. 151.



Diospyros Virginiana.

mined, has been long known to, and examined by the French pharmaciens. Mr. Ure is of opinion, that the Matias bark received by him from South America is identical with it. It is described by him, as three or four lines thick, brittle, although somewhat fibrous; of a brown colour, and covered with an ash coloured tuberculated epidermis; has an aromatic smell, and a bitter pungent taste, which it yields to water and alcohol,—the former being an agreeable bitter infusion, and the latter a powerful bitter tincture.

Malambo bark was analyzed by M. Cadet, and subsequently by M. Vauquelin, who found it to contain resin; a light volatile oil, and an extract very soluble in water. No tannic acid was, however, found in it; scarcely any gallic acid; and none of the alkalis of

the cinchonas; yet in New Granada, where the tree grows, it is held in high repute as an antiperiodic and stomachic.

Mr. Ure affirms, that he has frequently administered Matias bark, with good effect, as a substitute for cinchona; and Dr. Mackay states, that he has witnessed good results from its employment in cases in which an aromatic tonic was needed. An INFUSION may be made of two drachms of the bark to a pint of water; the dose of which is one or two fluidounces, repeated two or three times a day, in cases where a bitter stomachic is needed.

Besides agents already described, the Pharmacopœia of the United States has admitted into its secondary list the following astringents.

18. DIOSPYROS, *Persimmon*. This is the bark of *Diospyros Virginiana*; SEX. SYST. Diœcia Octandria; NAT. ORD. Ebenaceæ; an indigenous tree, well known in the southern and middle States; flowering in May or June; and producing a berry, which, in the green state, is exceedingly astringent; but, when ripe, is sweet, mawkish, and cloying. The unripe fruit has been recommended in infusion, syrup, and in vinous and acetous tinctures, by Dr. Mettauer, of Virginia. The bark, which is the official portion, is astringent and very bitter; and is adapted for cases in which a combination of astringent and bitter agents is needed.

Fig. 152.



Heuchera acerifolia.

19. GEUM, *Water Avens*—the root of *Geum rivale*, described under TONICS as indigenous in the United States—is often used as an astringent in the cases so often mentioned already, as requiring astringents. The dose of the powdered root is from ℥j to ʒj; but it is usually employed in DECOCTION; (Gei ʒj; Aquæ Oj. Dose f.ʒj or f.ʒij.)

20. HEUCHE'RA, *Alum root*—the root of *Heuchera cortusa*, *H. Americana*, *American Sanicle*; SEX. SYST. Pentandria Digynia; NAT. ORD. Saxifrageæ; a plant found in the middle States, flowering in

June or July. The root has a powerfully astringent taste, and—as well as the roots of other species of *Heuchera*—may be given in the same cases as vegetable astringents in general.

21. *RHUS GLABRUM*, *Sumach*. This is the fruit or berries of *Rhus glabrum*, *Smooth sumach*, *Upland sumach*; SEX. SYST. Pentandria Trigynia; NAT. ORD. Terebinthaceæ; found everywhere in the United States. It is astringent, and is sometimes used in infusion as a gargle in sore throat. The inner bark of the root, which also possesses astringent virtues, may be used as a collutory in mercurial ptyalism, and various forms of stomatitis.

22. *RUBUS TRIVIAL'IS*, *Dewberry Root*; and 23, *RUBUS VILLO'SUS*, *Blackberry Root*; SEX. SYST. Icosandria Polygynia; NAT. ORD. Rosaceæ; are the roots of well known plants, whose berries are much used as food. The main bitterness and astringency appear to reside in the bark of the root. It is rarely given in substance; but if this be desired, the dose may be twenty or thirty grains. It is commonly, however, prescribed in DECOCTION, (*Rub. trivial. vel R. villos. ʒj*; *Aquæ Oiss.* Boil to a pint.) Dose, f.ʒj to f.ʒij, repeated according to circumstances, in chronic diarrhœa and dysentery, and wherever vegetable astringents are indicated.

24. *RUMEX BRITAN'NICA*, *Water Dock*; and 25, *RUMEX OBTUSIFO'LUS*, *Blunt-leaved Dock*; SEX. SYST. Hexandria Trigynia; NAT. ORD. Polygonaceæ. The root alone of these docks is officinal. The plants are common in the United States; and the roots are possessed of astringent and tonic properties. They may be given in DECOCTION, (*Rumicis. ʒj*; *Aquæ Oj.* Dose; f.ʒj to f.ʒij) but are rarely employed.

Rumex crispus, a common species, is possessed of similar properties. Dr. N. S. Davis, of New York, is satisfied, from his experiments and observations, that the chief value of dock root “consists in its alterative and gently laxative qualities.” As an alterative he esteems it to be “fully equal to the far-famed sarsaparilla.”—*Quod est demonstrandum!*

26. *SPIRÆ'A*, *Hardhack*. The root of *Spiræa tomentosa*; SEX. SYST. Icosandria Pentagynia; NAT. ORD. Rosaceæ. It is astringent and tonic, and is employed in the same cases as the last. The best form perhaps of administration is the *decoction*, (*Spirææ ʒj*; *Aq. bullient. Oj.* Dose; f.ʒj to f.ʒij.)

27. *STAT'ICE*, *Marsh Rosemary*. The root of *Statice Caroliniana*; *Marsh Rosemary* or *Sea Lavender*; SEX. SYST. Pentandria Pentagynia; NAT. ORD. Plumbagineæ; is a powerful astringent; and although not much used in Philadelphia, and scarcely to be found in the shops, is regularly kept by the druggists in Boston, and other parts of New England, where large quantities of it are sold annually. It is certainly, according to all testimony, a valuable astringent, and well adapted for cases in which the vegetable astringents are prescribed. It has been

analyzed by Mr. Edward Parrish, of Philadelphia, and found to contain, amongst other less important matters, 12.4 per cent. of tannic acid—a much smaller quantity than exists in many other astringents; with extractive matter, to which its bitterness is due.

Decoction would appear to be the best form of preparation.

28. CREASOTUM.—CREASOTE.

Creasote, whose main properties have been described elsewhere, (Vol. i. 498,) owing to its power of coagulating albumen, as well as of exciting the vessels, with which it comes in contact, to contraction, has been employed as an indirect astringent in cases of hemorrhage; and is said to have been beneficial in hæmoptysis. In hæmatemesis, too, it has succeeded after the remedies, ordinarily prescribed, had been employed without effect. It has been given, also, with apparent advantage, as an internal remedy, in leucorrhœa, and bronchorrhœa; and Dr. Elliotson accomplished a cure in two cases of chronic glanders, in the course of a few weeks, by the sedulous use of an injection of a dilute solution, (one drop to a fluid-ounce of water,) thrown up the affected nostril,—combined with the internal use of the remedy.

In vomiting, not arising from inflammation or other organic disease of the stomach, creasote has been very efficacious; and even in Asiatic cholera and sea-sickness, it appeared to allay the vomiting. In the vomiting of the pregnant female, and in that originating from nervous excitability, it was equally beneficial. The testimony in regard to it has, however, been discordant. Drs. Elliotson, Shortt, A. T. Thomson, and Christison, consider it to be a valuable means of arresting vomiting. Drs. McLeod and Pereira speak doubtfully of it, and with Dr. Paris it entirely failed. The author's success has been by no means striking. Frequently, it has been devoid of efficacy, and in many cases it developed irritability of the stomach, when this did not previously exist. To very impressible persons, indeed, its odour and taste are extremely repulsive, and apt to produce nausea and vomiting. Externally applied, creasote is a valuable styptic. It was discovered at a time when Acqua Binelli enjoyed more confi-

Fig. 153.



Statice Caroliniana.

dence as a styptic than it does now ; and the fancied probability, that the nostrum was indebted to creasote for its virtues, gave rise to many experiments with the latter in cases of hemorrhage. When placed in contact with a bleeding vessel, it coagulates the albumen of the blood, forms a clot, and at the same time causes contraction of the bleeding vessel. It has been used extensively as a hæmastatic in epistaxis, bleeding from leech bites, and hemorrhage from large wounded surfaces ; as an astringent in profuse suppuration, and in excoriations of children, as well as in those induced by lying ; in gonorrhœa and leucorrhœa, in ophthalmia tarsi, and in prolapsus vaginæ, besides the various *morbi externi*, mentioned under EXCITANTS, (Vol. i. p. 499,) in which its remedial agency was rather excitant than astringent.

The dose of creasote, as an astringent, is one or two drops, several times a day, well diffused through mucilage of gum arabic. It is proper to remark, that a fluidrachm contains one hundred and fifty drops of creasote. It is best given in the form of pill, with crumb of bread and mucilage as the excipients. As a topical application, it may be mixed with water, with or without the addition of alcohol. *Creasote water*, as it is termed, is usually made with one part of *creasote* to eighty of *water*, and it is sufficiently strong for most purposes as a lotion or injection ; if not, the strength must be increased. An injection of a drachm of creasote to twelve ounces of starch, administered every night, has been extolled in camp dysentery.

A few articles, not in the Pharmacopœia of the United States, have been supposed to owe a portion of their medicinal efficacy to creasote ; viz :—

29. FULI'GO, *Wood Soot*.—A decoction of this has been used as an astringent in the form of injection, in cases of cystirrhœa ; and, it is said, with advantage. M. André Gibrin took from the chimney two ounces of compact soot, broke it up, washed it, and boiled it in a pint of water. After filtration, this was injected into the bladder twice a day. It has likewise been used as an injection in cases of chronic inflammation of the mucous membrane of the vagina.

30. AC'IDUM ACE'TICUM EMPYREUMAT'ICUM, *Pyroligneous Acid*, is prepared in chemical laboratories by the dry distillation of wood. The chief constituent of this is vinegar. It has been occasionally used in affections of the mucous membranes accompanied by discharges ; but is more employed as an antiseptic.

31. AQUA PICIS LIQ'UIDÆ, *Tar water* ; at one time so much extolled by Bishop Berkeley, and of late recommended in phthisis, but more especially in chronic bronchitis ; in the latter of which affections it is found to act like the generality of excitant expectorants. (See Vol. i., p. 240.) It may be made by digesting an ounce of *tar* in a quart of *water* for eight days, and then filtering. This may be taken with milk, to the extent of from eight to twelve fluidounces in the day.

It has likewise been used with advantage as an injection into the

bladder, in cystirrheæ, along with pills of turpentine. The injection was made by infusing for a night, in the cold, a pound of *tar* in ten pints of *spring water*; filtering and warming the solution before using it. Large quantities were injected through an elastic gum catheter, which was forthwith withdrawn, and the patient directed to retain the injection as long as possible. This was repeated daily.

For further particulars in regard to the preparation and properties of these agents, see the author's "*New Remedies*."

II. *Mineral Astringents.*

32. ALUMEN.—ALUM.

Alum, *Potash alum*, *Sulphate* or *Supersulphate of alumina*, is a double salt, consisting of sulphate of alumina and sulphate of potassa. It is found native as an efflorescence from certain rocks and soils principally in volcanic countries; and is termed *Native alum*; but is chiefly prepared artificially from *Alum slate*,—a rock which contains, in considerable proportion, sulphur, iron and alumina. Either by spontaneous decomposition, or by roasting, the sulphur receives oxygen and is converted into sulphuric acid; whence result sulphate of iron and sulphate of alumina. These are obtained in solution by lixiviation; and, to the liquor, sulphate of potassa is added. The sulphate of iron is got rid of by repeated crystallization.

Alum is manufactured in this manner to a great extent in various parts of Europe; whence it was, at one time, exported in considerable quantities to this country. Of late years, however, it has been made on an extensive scale by the chemists of the United States; and is sufficiently pure, as furnished by them, for medicinal purposes. It is, consequently, placed in the *materia medica* list, not only of the *Pharmacopœia* of the United States, but of those of Great Britain. The method of preparation generally adopted in this country consists in the direct combination of sulphuric acid with clay. It is made, however, in Baltimore on an extensive scale by burning an ore, found at Cape Sable on the Magothy river, Maryland, which consists of lignite, clay, sulphuret of iron and sand. To the solution, obtained by lixiviating the ashes, sulphate of potassa is added; and crystals are obtained by evaporation. (Wood & Bache.)

As met with in the shops, it is generally in broken fragments of crystals; which are transparent; colourless; of a sweetish astringent taste, and slightly efflorescent. It usually crystallizes in regular octohedrons, frequently with truncated edges and angles, and sometimes in cubes. The size of the crystals is at times very large. Dr. Christison states, that at Hurler, near Paisley, which has been long celebrated for the manufacture of this salt, it has sometimes crystallized in columns two feet in length, weighing fifteen pounds, and consisting of a pile of octohedrons of great size. It dissolves in from fifteen to eighteen times its weight of cold water, and in less than its own weight of boiling water.

Such are the main characters of the alum of the shops. A variety of

alum from Italy, called *Roman alum*, is covered with a rose-coloured efflorescence containing oxide of iron; and another called *Roche* or *Rock alum*, from Roccha in Syria, is coloured with rose-pink. These are not used in medicine.

The only impurity, which alum is apt to contain, is oxide of iron: the presence of this is detected by precipitating the solution with potassa, and redissolving the alumina by an excess of the alkali;—sesquioxide of iron is left.

Alum is a powerful astringent in small doses, and as such is used both internally and externally. In large doses, it acts both as an emetic and a cathartic. In hæmatemesis, and hæmoptysis, it has been given in large doses, and, in the former affection especially, with great advantage, inasmuch as it can come in contact with the vessels exhaling the blood, and act as a styptic. It has been prescribed in all forms of internal hemorrhage; and in all increased discharges from mucous membranes, especially from those of the stomach and bowels. In one disease of the bowels,—lead colic,—it has been recommended; but it is not easy to see on what principle. By some, it has been supposed to act on the lead presumed to be in the stomach, so as to form an inert sulphate of lead; but this is a mere supposition. On the same principle, sulphuric lemonade has been advised. One observer,—M. Gendrin—affirms, that he has cured more than three hundred cases by administering daily from a drachm to a drachm and a half of sulphuric acid diluted in three or four pints of water; and it is said to have been an efficacious prophylactic against the disease in the laboratories of Paris. The experience of M. Gendrin has been corroborated by that of others; but the same agent has been found entirely useless by some. The truth would seem to be, that the disease, in many cases, terminates in health under very simple management. Of thirty-one cases, in which nothing but the ordinary *tisane* of the French hospitals was given for twelve days, three were cured by the fourth day; two between the fifth and eighth days; ten between the eighth and twelfth days, and one on the thirteenth day. The remaining cases were subjected, after the twelfth day, to purgative treatment, under which they were speedily cured. It is said to have wonderful influence in allaying the tormina, and nausea and vomiting that attend upon the disease.

It has, likewise, been given freely in the colliquative sweats of phthisis, and in diabetes; but in neither case can it be presumed to act more than as a palliative. It appears to be adapted for all affections in which powerful astringents are deemed necessary. Its efficacy in hooping cough has been highly extolled of late by Dr. Davies of London. After a long trial, he says, he is disposed to attach more importance to it as a remedy in that disease “than to any other form of tonic or antispasmodic.” He has often been surprised at the speed with which it arrests the severe spasmodic fits of coughing, and it has seemed to him to be equally applicable to all ages, and almost to all conditions of the patient. The fittest state for its administration is “a moist condition of the air passages, and freedom from cerebral congestion; but an opposite condition would not preclude its use, should this state not have yielded to

other remedies. It generally keeps the bowels in proper order,—no aperient being required during its use.

As a topical application, also, it is in extensive use. It enters into the composition of astringent gargles and collutories, injections, and lotions for the treatment of relaxation of mucous membranes. It is an excellent styptic to constrict vessels that are allowing blood to escape from them, either by division or transudation; hence it is used as a styptic in hemorrhage from the nose, rectum or vagina,—a solution being injected; or lint, or rags, or sponge moistened with it being introduced into those outlets. In the first and last affection, the author has found it necessary, more than once, to dip moistened lint in powdered alum and introduce it. A saturated solution forms a good application to leech-bites; but where the bleeding is obstinate, it may be necessary to apply the powdered alum itself.

As a collyrium, it is often prescribed, and as a wash in inflammations in general. When unsuccessful in the early stages it may even augment the inflammation; but after the inflammation has become chronic, its agency becomes gradually beneficial, and is exerted in the manner elsewhere mentioned of excitant applications.

It may likewise be used as an astringent wash to ulcers that are attended with too copious a secretion; or that are flabby and ill-conditioned; and it is frequently of service in various forms of stomatitis.

The insufflation of alum has been recommended in cases of diphtheritis. About a drachm of the fine powder is placed in a tube, and blown into the patient's throat. It is, also, occasionally applied by means of the finger to the throat, when affected with other forms of inflammation and ulceration. It appears to possess the property of dissolving false membranes, whilst, at the same time, it induces a new action in the parts beneath.

The ordinary dose, as an internal remedy, is from gr. x. to ℥ij; but in lead colic it is sometimes prescribed in the dose of ℥ss to ℥ij. It may be given in pill, with extract of gentian as an excipient. In whooping cough, Dr. Davies gives it to an infant in the dose of two grains three times daily; and to older children in the dose of four, five and up to ten or twelve grains, mixed with Syrupus Rhæados—whose virtues do not differ from those of simple syrup—and water. It is seldom disliked.

It is sometimes prescribed in the form of *Alum whey*, which is made by boiling ℥ij of powdered alum in a pint of milk, and straining. The dose of this is a wine-glassful. As a collyrium, it may be used in the quantity of one to eight grains dissolved in a fluidounce of rose-water; and in injections and lotions the strength must vary according to the object which the practitioner has in view. It is occasionally applied in ophthalmia in the form of CATAPLASMA ALUMINIS of the Dublin Pharmacopœia, which is made by briskly agitating two whites of eggs with a drachm of alum. In cases of chronic and purulent ophthalmia it is placed between folds of linen and applied to the eye. It has also been recommended as a good application to unbroken chilblains. A poultice, made of the curd resulting from coagulating milk by means of alum, is sometimes used.

33. PLUMBI ACETAS.—ACETATE OF LEAD.

Acetate of lead, Sugar of lead, Acetated Cerusse, Superacetate of lead, Saccharum Saturni, is made on the large scale by the manufacturing chemist; and is, therefore, with much propriety, placed in the *materia medica* list of the Pharmacopœia of the United States. The pharmacopœias of London, Edinburgh and Dublin, however, contain formulæ for its preparation, which consist in dissolving litharge or protoxide of lead, or carbonate of lead, in diluted acetic acid, and crystallizing. On the large scale, it is made by hanging lead plates in distilled vinegar or diluted pyroligneous acid. A saturated solution of protoxide of lead may be formed in this way; and the acetate is obtained by evaporation and crystallization.

Acetate of lead of the shops appears as a mass of needle-like crystals, which are transparent, colourless, and belong to the oblique prismatic system. (Pereira.) The taste is at first sweet, and afterwards astringent; and has an acetous odour. In a dry and warm atmosphere, it slightly effloresces; and is apt to be decomposed by the carbonic acid of the air, and to become partially insoluble. Temperate water dissolves about four-fifths of its weight, according to one observer, (Turner;) two-fifths, according to another. It is soluble, likewise, in alcohol. When dissolved in water,—owing to the fluid containing carbonic acid, a carbonate of lead is formed, which renders it turbid. This may be prevented, however, by the addition of a few drops of acetic acid. It is not often adulterated.

In large doses, acetate of lead is a violent poison of the irritant class. In smaller doses, when continued for any length of time, it may give rise to the peculiar symptoms of lead-poisoning. Yet it has been repeatedly prescribed by the author, and by a large number of respectable therapeutists, in considerable quantities, without the supervention of any such results. Its effect upon the system is preceded by a narrow leaden blue line, which is seated at the edges of the gums, where they are attached to the neck of two or more of the teeth of either jaw. Dr. Burton has pointed out this symptom; and Dr. Pereira states, that in every case of lead colic that has fallen under his care, he has observed it, and in most of the cases it was accompanied by abdominal pain. The view of Dr. A. T. Thomson is, that acetate of lead becomes poisonous by being converted into carbonate in the stomach, and he affirms that if it be associated with vinegar, it may be administered freely, and with safety. Dr. C. G. Mitscherlich, however, has shown, that acetate of lead is a poisonous salt; and that when mixed with acetic acid it is more energetic than when given in the neutral state. It is now much employed as a sedative astringent in various forms of hemorrhage; and alone, or associated with opium, is highly esteemed by several practitioners, although in many cases the good effects are more ascribable to the general treatment combined with it. It has, also, been freely prescribed in chronic diarrhœa and dysentery, as well as in cholera, cholera morbus, and cholera infantum. Some practitioners have extolled it highly in the first of these affections. In phthisis, it has been used, of

course only as a palliative, for checking colliquative sweats, and diarrhœa; and both in that disease and in chronic bronchitis, it has seemed, according to some, to diminish profuse expectoration. In the irritability of stomach, that sometimes forms part of the phenomena of remittent and yellow fever, sugar of lead has succeeded when other remedies had failed.

As a topical application it is much employed. It has been used as a wash to check profuse pytalism induced by mercury, and in aphthous stomatitis,—care being taken to wash the mouth well afterwards, to prevent the teeth from being blackened. It is, likewise, applied to inflamed parts—to phlegmonous and erysipelatous inflammation, conjunctivitis, &c.; and is used as an injection in gonorrhœa, leucorrhœa and gleet. Cautions have been given against its use in ulcerations of the cornea, that attend purulent and pustular conjunctivitis, as it forms a white compound, which is deposited in the ulcer, to which it adheres tenaciously, and in the healing becomes permanently imbedded in the structure of the cornea.

The dose of acetate of lead is from one or two grains to six or eight, repeated several times a day, in the form of pill, or, as suggested by Dr. A. T. Thomson, in diluted distilled vinegar, to prevent its conversion into carbonate. It is often associated with opium, both for internal and external exhibition; and Dr. Christison affirms, that for erythema and erysipelas, one of the best forms of application is a lotion composed of four grains of *acetate of lead* and four of *opium*, to every fluid ounce of *water*. A decomposition always takes place,—meconate of lead being deposited, and acetate of morphia remaining in solution. The author has seen sulphuric acid prescribed as an astringent along with acetate of lead, which must have been owing to gross ignorance or inadvertence, inasmuch as the sulphate of lead formed is wholly inert. When acetate of lead is used as a collyrium, the strength may be from one to five grains to a fluidounce of water or rose water. This may be dropped between the eyelids, or be applied by means of an appropriate eye-glass;—or rags constantly wet with it, or a cataplasm of crumb of bread, to which it has been added, may be applied to the inflamed part. In inflammations of the cutaneous surface it may be applied in the same way; but the lotion may be made much stronger,—for example, ten to twenty grains to the fluidounce; and it may be used in the same proportion, as an injection, in cases of chronic diarrhœa and dysentery, and in leucorrhœa. In gonorrhœa, the strength may vary from gr. v to ʒss and more to the ounce.

LIQUOR PLUMBI SUBACETATIS, SOLUTION OF SUBACETATE OF LEAD, *Solution of Diacetate of Lead.* (*Plumb. acetat.* ʒxvi; *Plumb. oxid. semivitr. pulv.* ʒixss; *Aq. destillat.* Oiv. Boil for half an hour, adding distilled water so as to preserve the quantity. Filter.) Semivitreous oxide of lead, commonly called *litharge*, is a protoxide of lead; so that when it is boiled with acetate of lead, a large quantity of it is dissolved, and the subacetate results. This has been long known under the name of *Goulard's Extract*. As directed by the Pharmacopœia of the United States, it is a colourless liquid; s. g. 1.267. Carbonic acid—even that which

is contained in water—occasions a precipitate of carbonate of lead, and the same result ensues from exposing it to air; hence it is properly directed to be kept in closely stopped bottles.

Solution of subacetate of lead is used externally only, and in the same cases as a solution of acetate of lead. It is rarely employed except in cases of external inflammation, such as that which characterizes sprains, burns, or ordinary phlegmonous or erysipelatous inflammation. It is always, however, diluted; and is also directed to be kept in the shops in the form of

LIQUOR PLUMBI SUBACETATIS DILUTUS, DILUTED SOLUTION OF SUBACETATE OF LEAD, LEAD WATER. (*Liq. plumbi subacetat. f. ʒij; Aq. destillat. Oj.*) This is *Goulard's Vegeto-mineral water*, *Goulard*, and is used in the cases above mentioned,—cloths being kept constantly wetted, and applied to the inflamed parts.

34. PLUMBI CHLORIDUM.—CHLORIDE OF LEAD.

Chloride of lead is formed when oxide of lead is digested in muriatic acid. It falls, also, as a white precipitate, when a salt of lead is added to any soluble chloride. In the London Pharmacopœia, it is directed to be formed from acetate of lead and chloride of sodium.

It is a white crystalline powder, soluble, according to the London College—who have admitted it into their Pharmacopœia as one of the substances employed in the preparation of morphia—in 30 parts of water at 60°, and in 22 parts at 212°.

Chloride of lead acts locally on the tissues as an astringent and caustic; and according to some as an anodyne. Mr. Tuson employed it with some success, both in the form of ointment and lotion, in cancerous ulcerations. As a lotion, he says, it is of use in producing a healthy surface of the sore, removing fœtor and relieving pain; and when the ulcer has not been extensive, it has healed under its application. In painful neuralgic tumours, it proved very beneficial in relieving pain. When applied to any great extent by rubbing it over the part, in the form of ointment, it has produced a numbness of the arm; and, from the observations made by Mr. Tuson in watching the effect of the application, he was induced to think, that the pain was removed by paralyzing the nerves of the adjacent parts. He is inclined to believe, that when combined with other applications and appropriate internal treatment, it may be of considerable service in certain cancerous affections.

A solution may be made of one drachm of the chloride to a pint of water—an ointment, of one drachm of the chloride to an ounce of simple cerate.

35. ACIDUM SULPHURICUM.—SULPHURIC ACID.

Sulphuric acid—whose properties are detailed under the head of Tonics, (Vol. ii. 72,)—is possessed of astringent virtues; and, as such, is frequently prescribed in atonic hemorrhages, especially in those that

proceed from the lining membrane of the intestines, singly or combined with sulphate of magnesia, and under the views given elsewhere, (Vol. i. 190). It is also prescribed in the colliquative sweats of phthisis as a palliative, often associated with opium, (*Acid. sulphur. dil., Tinct. opii, aa partes æquales.* Dose, ten drops every three or four hours.) In chronic diarrhœa and dysentery, it has been administered; but is not had recourse to frequently. It is prescribed in the form of

ACIDUM SULPHURICUM DILUTUM, DILUTED SULPHURIC ACID, (Vol. ii. 72,) of which the dose is ten drops, three or four times a day, in water, or of

ACIDUM SULPHURICUM AROMATICUM, AROMATIC SULPHURIC ACID, ELIXIR OF VITRIOL, (Vol. ii. 72). The dose of this is the same as that of the last.

Diluted sulphuric acid is sometimes applied externally to arrest capillary hemorrhage, as in wounds, epistaxis, &c. It is likewise employed, when properly diluted, as an astringent gargle in relaxed sore throat, in ulcerations of the mouth and throat, and in ill-conditioned ulcers in general,—as well as to check ptyalism when profuse.

36. ARGENTI NITRAS.—NITRATE OF SILVER.

Nitrate of silver, whose properties have been described under TONICS, (Vol. ii. 68,) is rarely given internally as an astringent. It is sometimes, however, prescribed in chronic diarrhœa and dysentery; and in the follicular affection of abdominal typhus—the typhoid form of adynamic fever; and, it is said, with benefit. The author has used it, but has not been satisfied that it possessed any special advantage in such cases. It may be given either alone or associated with opium. It was elsewhere remarked, that whenever nitrate of silver comes in contact with chlorohydric acid, or a chloride, it is decomposed,—and that as the acid exists in health in the stomach, and chloride of sodium is present in most of the secretions, *chloride of silver* must be formed in the stomach; and perhaps the beneficial effects, ascribed to the nitrate as an internal remedy, may properly belong to the chloride. Under this idea, chloride of silver was given in the wards of the Philadelphia Hospital by one of the resident physicians, Dr. Perry, and, in his opinion, with advantage. The author has also frequently prescribed it; and on the whole it has appeared to him to be equal to the nitrate in chronic diarrhœa and dysentery, and in other cases in which the latter is indicated as an astringent.

It is, however, as an external astringent that nitrate of silver is most employed. Independently of its action as a caustic and powerful topical excitant, to be referred to hereafter, it is used as a gently excitant astringent in local inflammation, especially of the conjunctiva. It may be applied as a collyrium in the strength of a grain or two to the fluid-ounce of distilled water; and may be employed even in the acute stage of the inflammation, although it is most decidedly beneficial in the chronic stage. It is sometimes used in similar cases in the form of oint-

ment,—from two to ten grains of the *nitrate* to an ounce of *lard*, or of *simple ointment*,—and a piece, the size of a pin's head, and even larger, being introduced between the eyelids by means of a camel's hair pencil. Warm fomentations are used at the same time, and the application of the ointment is repeated every third day. It is not often employed, however, in this mode, in ordinary ophthalmia. In the purulent variety, it is prescribed both in the acute and chronic stage; but especially in the latter. In the variety of ophthalmia that affects the tarsi, this ointment is often highly beneficial, applied by means of a camel's hair pencil to the tarsal cartilages.

A lotion, consisting of from five grains to twenty of the *nitrate* to a fluidounce of *water*, is often of great advantage in stomatitis and pharyngitis accompanied by ulcerations: the solid nitrate is even required at times; and it has been passed over the tongue so as to reach the lining membrane of the larynx in chronic laryngitis and that of the pharynx in diphtheritic pharyngitis. In cases of chronic diarrhœa or dysentery, which appear to be dependent upon ulceration of the rectum, the lotion may be thrown up in the way of injection. In gonorrhœa and leucorrhœa of the female, nitrate of silver has been used both in solution (gr. iij—xx to a fluidounce of water) and in the solid state; but at times, serious inflammation results from the latter form of application. In the gonorrhœa of the male, the solution may be used; and occasionally an ointment proves effectual, applied around a bougie; but inflammation of the urethra sometimes results from it. (Pereira.) By Dr. MacDonnell, of Montreal, a solution has been thrown into the bladder in chronic inflammation of that organ and with much success. The strength of the solution had seldom to be increased beyond five grains to the fluidounce.

It can be readily understood, that in a variety of ulcers, and chronic cutaneous diseases, the excitant effects of this powerful agent may be advantageous. The dose as an internal astringent, is from an eighth to half a grain, gradually increased to three or more, twice or thrice a day. Extract of gentian may be the vehicle.

The OXIDE OF SILVER has been given by Mr. Lane with success in uterine hemorrhage both in the impregnated and unimpregnated state; and, Sir James Eyre has strongly recommended it in the treatment of profuse menorrhagia. It has likewise been given in leucorrhœa and dysmenorrhœa, hæmoptysis, hæmatemesis, hemorrhage from the intestinal canal and obstinate chronic diarrhœa, and in the profuse purulent expectoration and perspiration of phthisis. Much benefit could scarcely however be expected from it in the last mentioned cases. According to the experience of Sir James, it is superior to ergot, gallic acid, and, indeed, all other remedies. Mr. Lane esteems it to be essentially sedative, and employs it both internally and externally. He recommends it in irritable ulcer, chronic ophthalmia; ulceration of the cornea, with thickening of the eyelids; applied in the form of ointment by means of a camel's hair pencil. Although neither Mr. Lane nor Dr. Golding Bird observed any coloration from its internal use after it had been

continued for several weeks; it is doubtless liable to occasion it. Dr. Pereira suggests, that it may be continued for five or six weeks with safety. The dose is half a grain three times a day, gradually augmented to one or two grains or more. An ointment may be made of from twenty grains to a drachm of the oxide to an ounce of lard.

37. CUPRI SULPHAS.—SULPHATE OF COPPER.

Sulphate of copper, whose general properties are described elsewhere, (Vol. i. 122,) has been advised as an astringent in chronic diarrhœa and dysentery, and it is said to have proved successful when the ordinary vegetable astringents had failed. Dr. Pereira states, that he has employed it with excellent effects in chronic diarrhœa of infants, in doses of one-twelfth of a grain. It has likewise been given in increased discharges from other mucous membranes.

As an external agent, it is used in the same cases as nitrate of silver, and especially in inflammation of the conjunctiva, of the mucous membrane of the mouth and fauces, and of the genito-urinary apparatus both of the male and female. In gangrenous stomatitis, commonly called *cancreum oris*, it has been highly recommended by Dr. B. H. Coates, of Philadelphia. Solid, or in solution, it is an excellent stimulant to ill-conditioned ulcers; and superficial ulcerations often heal very readily by a single application, either of the sulphate of copper, or of the nitrate of silver in substance. This is strikingly the case in the superficial ulcerations often caused by stomatitis.

A strong solution (gr. xx to xxx to the fluidounce of water) is employed as a styptic in cases of capillary hemorrhage, as from leech bites; and sometimes the powdered salt is required to repress the flow. The dose of sulphate of copper, as an internal astringent, is an eighth or a quarter of a grain, made into pill with crumb of bread or extract of gentian, and given two or three times a day. A grain or two to the fluidounce of distilled water forms a good excitant astringent collyrium; and lotions may vary in strength from two to fifteen grains or more. The lotion, used by Dr. Coates in gangrenous stomatitis, consists of *sulphate of copper* ʒij; *powdered bark* ʒss; *water* f.ʒiv.

38. TINCTURA FERRI CHLORIDI.—TINCTURE OF CHLORIDE OF IRON.

Tincture of chloride or muriate of iron, described elsewhere as a tonic, (Vol. ii. 57,) is likewise a powerful astringent, both when administered internally and externally. In cases of hæmatemesis, it comes in contact with the vessels that exhale the blood, and may therefore act as an external styptic; but it has likewise been extolled in hemorrhage of the asthenic kind from other parts, as from the uterus and urinary organs. It has also proved beneficial in cystirrhœa, and in gleet; and some have presumed, that it may have a 'specific' influence over the whole of the urinary apparatus, "for on no other supposition can we explain the remarkable effects which it sometimes produces in affections of the kidneys, bladder, urethra, and even of the prostate gland;" yet Dr. Pereira, from whose excellent pharmacological work this quotation

is made, shows, that such is not the verdict of the profession, and it would be strange if it were. It may be averred with confidence, that we have not in the lists of the *Materia Medica* any therapeutical agent, which possesses such influence on any organ. Dr. Pereira affirms, that he has found the tincture occasionally successful, when given in conjunction with tincture of cantharides, in the latter stage of gonorrhœa; after a variety of other remedies had failed. It is likewise used as an external styptic in capillary hemorrhage, and as a local astringent in bleeding ulcers, as well as in those that are accompanied by profuse secretion.

The dose is from ten to thirty minims, which may be gradually augmented to f.ʒj or f.ʒij twice or thrice a day, in some diluent.

39. FERRI PERNITRAS.—PERNITRATE OF IRON.

A solution of pernitrate of iron—persesquinitrate—*Liquor Ferri Persesquinitratis* has been introduced into notice, of late years, chiefly as an astringent. It is made by dissolving small pieces of iron in nitric acid, and adding a little muriatic acid, to prevent the persesquinitrate formed from undergoing decomposition,—according to the following formula. Take of small chips or pieces of iron wire, ʒiiss; nitric acid, f.ʒij; water, f.ʒxxvij; muriatic acid, f.ʒj. Put the iron into an earthenware vessel, and pour on the nitric acid, previously diluted with fifteen fluidounces of the water. Set aside until the whole of the nitric acid has united with the iron; decant the liquid from the undissolved iron; strain; filter, and add the remainder of the water with the muriatic acid; or as much of the water as will make the whole solution thirty fluidounces.

It resembles tincture of chloride of iron in its medical properties. It has been used as an astringent in chronic diarrhœa; and in affections of the mucous membranes that are accompanied by discharges. It has been advised in cases of aphthous sores, and is said even to have relieved toothache. It is, unquestionably, a powerful astringent; but it is doubtful whether it possess any advantage over tincture of chloride of iron. The dose of the solution, prepared according to the form given above, is ten or fifteen drops, gradually increased to twenty or twenty-five drops, three or four times a day. It has been considered to be especially adapted for diminishing irritability and tenderness of the mucous membranes with which it comes in contact.

40. FERRI SULPHAS.—SULPHATE OF IRON.

Sulphate of iron—whose chief properties are described under TONICS, (Vol. ii. 60,) is an astringent, and as such has been prescribed in the cases in which tincture of chloride of iron is indicated. It is given internally in all forms of asthenic discharges from mucous membranes; and externally is employed in collyria, lotions to inflamed parts in general, and injections. The dose of the sulphate, as an astringent, is from one to five grains, in the form of pill. If administered in solution, the water should be boiled to expel the air contained in it, the oxygen of which would convert the salt into a persulphate. As a collyrium,

a grain or two may be dissolved in a fluidounce of water. Lotions may, of course, be made of various strengths to suit the particular case: as a general rule, however, from four to ten grains to the fluidounce of water will be sufficient. In leucorrhœa and prolapsus ani, the quantity of the sulphate may be doubled or trebled. It is not very much employed, either as an external or internal astringent.

41. ZINCI SULPHAS.—SULPHATE OF ZINC.

Sulphate of zinc—whose general properties have been described under the head of EMETICS, (Vol. i. 121,)—is occasionally given internally, as an astringent, in the same cases as acetate of lead; but it is not very frequently prescribed. It is more often, perhaps, used in chronic mucous discharges, especially chronic catarrh, chronic gonorrhœa and leucorrhœa; and Dr. Christison affirms, that he has often prescribed it with the best effects in obstinate chronic gleet, in doses varying from three to six grains, twice or thrice a day.

It is most frequently used as an external astringent, and as such forms a convenient collyrium, more especially in cases of chronic, or purulent ophthalmia. It is likewise prescribed, as an injection, in gonorrhœa, leucorrhœa, and gleet; and is applied as a lotion in aphthous affections of the mouth, and in relaxation of the uvula, and of the mucous membrane of the isthmus faucium; but its disagreeable and enduring taste prevents it being much used in the last cases. A solution of sulphate of zinc is often applied in external inflammation, and as a wash to ulcers attended with too copious a discharge.

The dose, as an internal astringent, is from gr. j to gr. vj in the form of pill. As a collyrium, the proportion may be gr. j to gr. x. to a fluidounce of water;—as an injection in gonorrhœa, gr. v to gr. x; and in leucorrhœa, from gr. x to gr. xx. As a wash to ulcers and to external inflammations, the proportion may be the same.

42. CRETA.—CHALK.

Chalk or native friable carbonate of lime is met with in abundance in various parts of Europe; whence it is exported to this country. It is not found native, however, in a state fit for medical purposes; but requires washing to separate it from the gritty particles which it contains. It then forms CRETA PRÆPARATA of the pharmacopœias. When pure, it is wholly soluble in dilute chlorohydric acid with effervescence; and the solution yields no precipitate with ammonia. It is devoid of taste and smell; is almost insoluble in water, and much more soluble in carbonated water. When applied to the tongue, it adheres slightly to it.

It is used as an indirect astringent to the intestinal canal, probably on account of its absorbent properties. It certainly diminishes the number of alvine discharges; and, like argil, seems to form with the gastric acids salts that are binding. It is much used for checking diarrhœa,

either alone or combined with opium, or with true astringents,—as kino and catechu.

As a local application, it is dusted on inflamed parts, whose surface it covers and protects from the desiccative and irritating action of the air. Dusted on excoriations, ulcers, burns, scalds, &c., it appears to be beneficial by absorbing ichorous or other discharges.

When given in powder, the dose is gr. x to ʒss or ʒj, frequently repeated.

MISTURA CRETÆ, CHALK MIXTURE. (*Cretæ præparat.* ʒss; *Sacchar., Acaciæ pulv.* āā ʒij; *Aquæ Cinnam., Aquæ* āā f.ʒiv.) This preparation is very much used in diarrhœa accompanied with predominance of acid. Tincture of opium, or infusion of kino or catechu, is frequently associated with it. The dose is f.ʒss to f.ʒij.

43. TESTA PRÆPARATA.—PREPARED OYSTER SHELL.

This is made by freeing oyster shells from extraneous matter, washing them with boiling water, and reducing them to powder by levigation.

Prepared oyster-shell is really only carbonate of lime, intimately associated with animal matter. It does not differ, consequently, in its medical properties from chalk. The animal matter is supposed, by some, to render the carbonate of lime more acceptable to the stomach; but it is doubtful whether it possess any such agency. It is still retained in the Pharmacopœia of the United States; but has been expunged from that of Edinburgh; and Dr. Christison states, that there is no other reason for any British college retaining it, than that in some places it is more easily obtained than other forms of carbonate of lime.

44. LIQUOR CALCIS.—LIME WATER.

Lime water—which is prepared by pouring a gallon of water on four ounces of quicklime, preserving the solution in stopped glass bottles—is a solution of lime in water; and the object of protecting it from the air is to prevent the access of carbonic acid, which would unite with the lime, and form a carbonate of lime, that would be deposited.

Like chalk, lime water possesses the power of diminishing the number of alvine evacuations; and is therefore employed in cases of diarrhœa, especially when accompanied by acidity. It has, likewise, been prescribed in diabetes, and in other cases in which an internal astringent is needed. It possesses the power of corrugating and indurating animal matters. In vomiting, induced by irritability of the stomach, and perhaps owing to too much secretion of acid, lime water mixed with an equal quantity of milk has been one of the best remedies; and Dr. Wood, of Philadelphia, states, that he has found a diet exclusively of lime water and milk more effectual than any other plan of treatment in dyspepsia, accompanied with vomiting of food. In this case, one part of lime water to two or three parts of milk is usually sufficient.

It is used as an injection in gonorrhœa after the active inflammation has passed away ; and in ulcerations or increased discharges from the bladder. It is, likewise, employed occasionally as a wash to flabby ulcers, and to chronic eruptions,—as scabies and porrigo.

LINIMENTUM CALCIS, LINIMENT OF LIME. (*Aquæ Calcis, Ol. Lini, āā f.℥j.*) *Liniment of Lime water, Carron Oil*,—as it was called, in consequence of having been first used at the Carron works in Scotland,—has long been a favourite application in cases of recent burns and scalds. The oil and lime form a soap, which, when smeared over the burnt surface, prevents the irritating influence of the air ; or if it be applied by means of a rag, the areolæ of the rag are filled up by it, and the same object is accomplished. Lime water probably exerts none of its ordinary remedial agency in those cases, the effect being mainly mechanical.

45. ARGILLA PURA.—PURE ARGIL.

Pure argil, *Alumina, Oxide of Aluminum*, was formerly known under the names *Armenian Bole, Terra sigillata, &c.*, and was much employed as an astringent in hemorrhages, diarrhœa, dysentery, &c. ; but it had fallen into oblivion, when it was again brought forward as an efficacious astringent. It is usually prepared by drying sulphate of alumina and ammonia, and exposing it for twenty or twenty-five minutes to a red heat in a crucible. Sulphuric acid and ammonia are driven off, and the argil remains behind in the form of a white powder. It is devoid of smell or taste, but communicates a feeling of astringency to the tongue. When breathed upon, it exhales an earthy odour. It is insoluble in water ; but attracts moisture greedily from the air, and forms with it a gelatiniform mass.

Argil is absorbent ; and therefore, perhaps, an indirect astringent as regards the intestinal canal. It certainly diminishes the number of alvine evacuations. With the gastric acids, it seems to form salts that are binding ; and hence it has been given in the vomiting and diarrhœa of children in which there is usually a predominance of acidity. It has been associated in such cases with decoction of logwood, (*Argil. ℥ij ; Decoct. Hæmatoxyl. f.℥iv.* Dose, a tea-spoonful.) The dose of pure argil for a very young child, in the twenty-four hours, is from ʒss to ʒj ; for older children, from ʒj to ʒij. It may be administered in an emulsion.

IV. SEDATIVES.

SYNON. *Sedantia*.

General observations—Subdivision of sedatives—Definition of sedatives—Modus operandi—Thomson's table of sedatives—Mental sedatives—Blood-letting—Its effects—Cautions respecting its use—Arteriotomy, phlebotomy, local bleeding—Other sedatives—Contrastimulants—Special sedatives.

Under the head of Sedatives are included such agents as diminish action directly or indirectly. The division comprises some of the most important classes of remedies we possess; and such as are especially adapted for most of the numerous cases of acute disease that prove so fatal to mankind. On some of them, indeed,—in violent inflammatory cases,—entire confidence is reposed; and, if they fail, farther efforts are not likely to be of much service.

It may be said, that many of the *local excitants* already considered may be employed for the purpose of producing an indirectly sedative effect; and such is the case with many; hence they are used in febrile and inflammatory affections; but their sedative operation is not as evident from the commencement as those that are ranked under the division of sedatives. In the case of the narcotics classed by the author as sedatives, an excitant operation is observable when the agent is administered in a small dose; and, perhaps, even when given to a larger amount, there is always some degree of excitation perceptible on careful examination; but this is succeeded so rapidly and predominantly by the depressing agency, that the excitant property is disregarded, and recourse is had to them in the same manner as if they were SEDATIVES PROPER. These last may be defined—"agents that directly depress the vital forces." They are employed, consequently, whenever it is necessary to diminish preternaturally increased action. By many therapeutical writers, the class is not admitted; but there are certain remedial agents that cannot be brought under any other head;—blood-letting, for example. Their main effect is, doubtless, exerted, directly or indirectly, on the nervous system; and, through this, on other parts of the body.

The best evidence of the *modus operandi* of sedatives is afforded by the most powerful agent of the class with which we are acquainted—hydrocyanic acid. As before remarked, if a drop of pure hydrocyanic acid be placed on the tongue of an animal, its poisonous effects are so rapidly exerted, that the animal, at times, ceases to breathe almost before it can be removed from the lap of the experimenter. Yet it would not appear, that the heart and intestines, or even the voluntary muscles, have their contractility destroyed in poisoning by this agent; and Professor A. T. Thomson thinks, that this is true also as regards other sedatives. We might, consequently, understand, that if the deleterious agency of any sedative were extremely fugitive or evanescent, provided we could maintain artificial respiration—effect, that is, the conversion of venous into arterial blood—and keep up the circulation, time might be

allowed for the system to recover from the deadly influence, and resume its wonted action.

There are other circumstances, which confirm—were any confirmation needed—the position, that sedatives exert a direct influence on the nervous system. When hydrocyanic acid is applied to one limb only of a frog, the member becomes paralyzed, whilst the other limbs remain unaffected. Robiquet, in executing experiments on the tension of the vapour of hydrocyanic acid, after having exposed his fingers to it for some time, felt a numbness in them, which lasted for several days; yet he experienced no effect from the acid on his system.

Of the precise nature of the impression made on the nerves by sedatives, we know nothing. The most careful examination exhibits no physical alteration of their tissue. It is manifestly not one of excitement; but on the contrary: all the phenomena, as Dr. Thomson has remarked, prove that there are powers which destroy excitability and life without previous excitement, or, at least, without any signs of it being discoverable.

The author just mentioned divides sedatives, from the nature of their effects, into two distinct classes;—‘direct sedatives,’ or those which operate immediately on the nerves,—and ‘indirect sedatives,’ or those which operate through the medium of the vascular system,—as in the following table:

“A. DIRECT SEDATIVES.

* Organic products.

- a.—Cyanogen—combined with hydrogen, in
Hydrocyanic acid.
Laurel water.
Volatile oil of bitter almonds.
combined with potassium, in
Cyanide of potassium.
- b.—Empyreumatic volatile oil.
Tobacco smoke.
- c.—Nicotina—contained in the leaves of
Nicotiana Tabacum.

** Inorganic substances.

- d.—Sulphur—combined with hydrogen, in
Sulphuretted hydrogen gas.
Hydrosulphuret of ammonia.
- e.—Carbon—combined with hydrogen, in
Carburetted hydrogen gas.

B. INDIRECT SEDATIVES.

- f.—Carbon—combined with oxygen, in
Carbonic acid gas.
- g.—Blood-letting.

To this table might be added the sedation produced by a residence in certain localities, combined or not with the use of mineral waters, especially of the sulphurous kind,—as at the Red Sulphur Springs of Virginia, the waters of which are reputed to have a wonderful effect in reducing the pulse; and hence the place is a common resort, during the summer season, for the phthysical valetudinarian. To the same agency might, perhaps, be referred—a residence in mountain gorges, and in other situations, where there is a paucity of light, and an absence of excitants of all kinds; and certain emotions, which are of a depressing or sedative cast, and of which we have so marked an example in the nostalgic sadness, which, as before remarked, exerts so deleterious an agency on the Swiss, especially when absent from their native land.

Although there may be doubt entertained as regards the action of certain sedatives,—whether, that is, the sedative influence be or be not preceded by excitation,—there can be none as respects blood-letting. Even hydrocyanic acid has been supposed, by M. Magendie and others, to produce a transient excitement in the first instance, followed, however, immediately afterwards, by an opposite state; but closer examination, added to experiments on animals, seems to exhibit these views to be hypothetical. Indeed, there is scarcely sufficient time, in most cases, to note any excitation, so rapid is the transition from life to death, when the sedative is administered in a state of concentration; and, when more diluted, the effects are clearly of a depressing character. In the *modus operandi* of blood-letting, however, there is nothing equivocal. There can be no presumption of excitation before the depressing effects are perceptible; yet we can readily comprehend, that there may be states of the system, in which the abstraction of blood, instead of being followed by signs of sedation, may give occasion to greater activity of vessels, and to a manifestation of greater tone of the system than was apparent prior to the operation. Such is signally the case in the fevers termed *congestive*, where the powers of life appear to be depressed, in consequence of the accumulation of blood in the internal organs; but if the oppressing or depressing cause be removed by the abstraction of a due amount of blood, the powers of life develop new energy; the blood is regularly distributed through the different tissues and organs, and every sign of asthenia disappears.

The immediate effects of blood-letting on the system are readily appreciable. The impression is, from the first, one of sedation; and, accordingly, it is one of the sedative agents on which our main reliance is placed in diseases of excitement. Carried too far, however, it is well calculated to develop capillary excitement, in the mode to be mentioned presently. At one time, this was an evil which was never apprehended; and if, after excessive loss of blood, hyperæmia occurred in any organ, or was augmented if it had previously existed, the blood-letting was repeated, until the patient sank; the practitioner, not suspecting the cause of death; but consoling himself with the reflection, that the disease was irremediable, and that he had adopted the only judicious course for its removal.

When an animal is bled to death, it is observed—as the blood flows

—to become uncertain in its attitude; and, if it attempts to move, it staggers, and ultimately falls. This state is soon succeeded by convulsions, which, in death from hemorrhage, always precede dissolution. The same thing happens to the human subject, when death results from a rapidly fatal hemorrhage. The rationale of these phenomena would appear to be as follows.—As the blood flows from the vessels, the great nervous centres cease to receive that supply, which is requisite for the due performance of their functions; hence, the proper amount of nervous energy is no longer transmitted to the muscles; their contraction cannot be energetically maintained; alternate contractions and relaxations in the form of tremors become marked; and, if the flow of blood continues, there is not enough nervous influx transmitted to keep the extensors in a state of contraction; the animal consequently falls, and, unless the hemorrhage be now arrested, death is inevitable. The same inadequate supply of blood to the brain gives rise to irregularity of action in the cerebro-spinal axis; and hence convulsions.

Where hemorrhage takes place, naturally or artificially, to a less extent than this, and the individual recovers, a chain of analogous phenomena supervenes, with which it is important for the therapist to be acquainted. It would seem, indeed, that whenever the vital fluid is lost beyond a certain amount,—and in particular habits this amount need not be large,—a series of phenomena present themselves, or are apt to present themselves of a nervous kind, or dependent upon the loss of balance between the nervous and sanguiferous systems. Uterine hemorrhage affords the best example of the effects of great loss of blood in the human subject; although too many cases of mischief from the lancet of the practitioner are met with. When blood is discharged to an inordinate extent from the uterus, a feeling of faintness is sooner or later experienced; impaired vision and depraved audition,—in the form of tinnitus aurium, or other unusual noises,—supervene; and, if the hemorrhage be not arrested, fatal syncope ensues; generally preceded by more or less convulsive movement. If the patient recovers, it rarely happens that restoration is effected without symptoms presenting themselves, which are referable to the effect produced by the loss of blood on the nervous system. In the course of a few hours, although the female may have been, to all appearance, exanguious, she may be found complaining of violent headache, suffused face, with throbbing of the temporal and carotid arteries; yet these symptoms, as elsewhere remarked, are certainly not referable to a condition of the blood or of the blood-vessels, which farther blood-letting is capable of remedying. The mischief has been induced by loss of blood, and farther abstraction of that fluid could scarcely fail to add to the morbid condition.

A case, exhibiting the difficulty of distinguishing, without extreme care, whether the state of reaction be one of *sthenia* or *asthenia*, was exhibited, not many years ago, in an institution of which the author was one of the physicians. A man, whose leg had been amputated, was found one morning almost exanguious from the giving way of an artery. In a few hours, however, he recovered, and was seen by an experienced colleague, now no more, in the state of reaction, who was unac-

quainted with the history of the case, and, as soon as he placed his hand upon the pulse, inquired why the surgeon did not bleed him !

It may be laid down, perhaps, as a general law, that when blood is lost to a considerable amount, the great nervous centres receiving an inadequate—and the rest of the nervous system an irregular—supply their excitability becomes largely and irregularly developed ; so that, under this impressible condition of the nerves, the blood-vessels, whose functions are modified by them, assume augmented action ; and if, owing to the previous existence of hyperæmia in any organ, the nerves proceeding to that organ are in a morbidly excitable condition, a fresh development of excitability may ensue after the bleeding ; and the hyperæmic condition, instead of being relieved by the loss of blood, may be augmented by it. In individuals, whose nervous system is very impressible, the same effects may be induced by a full bleeding as have been described to result from excessive discharges from the uterus ; and, accordingly, where hyperæmic conditions occur in such individuals, the practitioner is cautious in the use of the lancet ; and if he employs it, he does not carry the depletion so far as to depress too much the powers of the system,—aware, that if he should do so, under the nervous irritability or neuropathia, which he develops, reaction might succeed to such an extent as to reproduce the exaltation of organic actions in the part, and perhaps to a greater degree than before the operation. It is in such impressible habits, that advantage is found in the adoption of other sedative agents ; and that a combination of blood-letting, short of inducing syncope, with a full sedative dose of opium, is often so serviceable ;—the bleeding diminishing the exaltation of the vital manifestations, by acting on the nerves through the blood-vessels ; and the opium preventing the subsequent development of nervous excitability. In strong individuals, the same plan, pushed to a still greater extent, is equally successful and not the less philosophical, when employed for the removal of internal inflammations. It is the plan which, as before observed, is adopted with so much success, in acute peritonitis ;—the bleeding being carried so far as to make a decided impression on the system, and the opium administered in a full dose ; a sedative influence is thus exerted on the body generally, and on the inflamed tissue in particular, under which the hyperæmia is effectually subdued.

Along with his friend, Professor N. R. Smith, of the University of Maryland, the author attended a case, in which many of the ordinary signs of inflammation of the encephalon were present ; yet both were satisfied, that great mischief would have resulted from copious abstraction of blood. The patient was a nervous female, who, soon after delivery, was attacked with excruciating cephalalgia, with the greatest intolerance of light and sound, so that every precaution was necessary to shut off those irritants. Along with this great impressibility, however, the tongue was moist ; and the circulation, though hurried, not augmented in force. She was bled ; but the symptoms were in no respect relieved. The operation was repeated to a trifling extent : so much palpitation and nervous turmoil were, however, induced by it, that it was not practised a third time ; but leeches were subsequently

applied to the epigastric region, for the removal of accidental gastro-enteritic symptoms. This state of excitability of the encephalon continued for weeks; and at length yielded to time and quiet, rather than to any particular system of medication; and under the cautious reapplication of light and noise to the optic and auditory organs, they became gradually accustomed to the stimulus, and the recovery was ultimately complete. Had depletion been carried to a greater extent in this case—as it would most certainly have been, by those practitioners, who believe that blood-letting is the only agent, that can be relied on as an antiphlogistic—great mischief would have, doubtless, resulted. Long, indeed, before Dr. Marshall Hall published his interesting "*Researches on the effects of loss of blood*," the author had been deeply impressed with what appeared to him to be the faulty views, entertained both as regards the pathology and the therapeutics of such cases as those mentioned; and had satisfied himself, that the maxim, inculcated by many practitioners as applicable to internal inflammations in general—"when you have bled in inflammation to such an extent, that you are doubtful, owing to the persistence of the symptoms, whether you should bleed again,—bleed"—was unphilosophical; and often, it was to be feared, attended with disastrous consequences. As a general rule, the author would say, on such occasions of doubt and difficulty,—“do not bleed, but have recourse to some other appropriate sedative, or revulsive agent, until your doubt is removed.” Every practitioner, much engaged with the diseases of women, must have met with cases of peritoneal inflammation in the puerperal state, in which, after bleeding has been practiced as far as he has esteemed it safe, the effects of a sedative dose of opium have been signally salutary. The irritability of the nervous system has been allayed; whilst there has been great reason to believe, that if the bleeding had been repeated, it might have been formidably developed.

It is only in comparatively late years, that the attention of therapeutists has been directed to a pathological condition giving rise to phenomena of ordinary occurrence, which, in one of the cases, ought to have been suspected earlier, from the effects, which we see developed, by loss of blood, on animals as well as on man. This occurs in certain encephalic affections, which were at one time—and are even now, by many therapeutists—considered to require imperatively loss of blood, generally or locally, or both. Coma and convulsions were once regarded as invariable evidences of *congestion* of the encephalic vessels; although what was precisely meant by the term, as employed by many writers, is not apparent;—whether, for example, the congestion was looked upon as an accumulation of blood in the vessels of the brain, produced by too great activity of the encephalic arteries; or as a remora of blood in the veins, owing to some asthenic or mechanical cause, seated in the veins themselves, or in the parts in which they creep. Both conditions were, however, considered to indicate blood-letting;—whether the turgescence, in other words, was active or passive, the abstraction of fluid was thought to be demanded. It is now known, that coma may exist independently of any fulness of the vessels of the encephalon; that it occasionally appears to be induced by a condition

the opposite to this ; and that the administration of excitants may be required for the removal of symptoms, closely resembling such as are cured by bleeding and by ordinary depletives.

The precise condition of the brain during sleep has been an interesting topic of discussion with the physiologist, and is yet *sub lite* ; but it may, perhaps, be unhesitatingly determined, that it is not directly dependent upon a modified circulation of the encephalon ; and that it is altogether a phenomenon of the neurine itself. Coma, being morbid sleep, cannot be wholly likened to that which occurs naturally. It is frequently the result of pressure made on the cerebral substance by vascular turgescence, or effusion ; but it may, and doubtless, does, occur from conditions of the cerebral structure itself ; and it by no means follows, that these must be conditions of turgescence or excitement. Dr. Gooch has an excellent chapter on this subject in his work on '*Some Diseases Peculiar to Women.*' It is entitled, "Of some symptoms in children erroneously attributed to congestion of the brain:" these he regards as dependent rather upon loss of nervous power. "I am anxious," he says, "to call the attention of medical men to a disorder of children, which I find invariably attributed to, and treated as, congestion or inflammation of the brain, but which, I am convinced, often depends on, or is connected with, the opposite state of circulation. It is chiefly indicated by heaviness of head and drowsiness ; the age of the little patients whom I have seen in this state, has been from a few months to two or three years ; they have been rather small of their age, and of delicate health ; or they have been exposed to debilitating causes. The physician finds the child lying on its nurse's lap, unable or unwilling to raise its head, half asleep, one moment opening its eyes, and the next closing them again, with a remarkable expression of languor. The tongue is slightly white ; the skin is not hot ; at times the nurse remarks that it is colder than natural ; in some cases there is at times a slight and transient flush : the bowels I have always seen already disturbed by purgatives, so that I can scarcely say what they are when left to themselves : thus the state which I am describing is marked by heaviness of the head and drowsiness, without any signs of pain, great languor, and a total absence of all active febrile symptoms. The cases which I have seen have been invariably attributed to congestion of the brain, and the remedies employed have been leeches and cold lotions to the head, and purgatives, especially calomel. Under this treatment they have gradually become worse, the languor has increased, the deficiency of heat has become greater and more permanent, the pulse quicker and weaker, and at the end of a few days, or a week, or sometimes longer, the little patients have died with symptoms apparently of exhaustion."

"The children, who were the subjects of this affection, and were thus treated," says Dr. Gooch, "died, not with symptoms of oppressed brain, but with those of exhaustion ; and, on examining the head after death, the blood-vessels were unusually empty, and the fluid in the ventricles rather in excess ; in two instances, death was preceded by symptoms of effusion, viz., blindness, a dilated pupil, coma and convulsions ; and after death the ventricles were found distended with fluid

to the amount of several ounces, the sinuses and veins of the brain being remarkably empty. I believe the prevalent notion of the profession is, that all sudden effusions of water into the brain are the result of inflammatory action; but, putting aside for a moment this dogma of the schools, consider the circumstances of this case. For several days before death, all that part of the circulating system, which was cognizable to the senses, was at the lowest ebb consistent with life, and after death the blood-vessels of the brain were found remarkably empty of blood, and the ventricles unusually full of water. From such facts I can draw no other inference than this, that this sudden effusion was a passive exudation from the exhalants of the ventricles, occasioned by a state of the circulation the very opposite to congestion or inflammation. This is corroborated by the dissection of animals which have been bled to death. Drs. Saunders and Seeds, of Edinburgh, found that in animals bled to death, whether from veins or arteries, there was found more or less of serous effusion within the head, and Dr. Kellie thus expresses himself:—"If instead of bleeding *usque ad mortem*, we were to bleed animals more sparingly and repeatedly, I have no doubt that we should succeed in draining the brain of a much larger quantity of its red blood; but in such experiments we shall, I think, find a larger effusion of serum."

"It is surely impossible"—he adds—"for the reader to mistake me so far as to suppose that I am denying the important practical truths, that heaviness of head and drowsiness of children commonly depend on congestion, and are to be relieved by depletion, and that acute hydrocephalus is a serous effusion, the result of inflammation, and capable of being cured only in the inflammatory stage by bleeding and purging. These vital truths I would state as strongly as any man, but there are opposite truths. All that I mean is, that these symptoms sometimes depend, not on congestion, which is to be relieved by bleeding, but on deficient nervous power, which is to be relieved by sustaining remedies. All I advise is, that not only the heaviness of head and drowsiness should be noticed, but the accompanying symptoms also, and that a drowsy child, who is languid, feeble, cool, or even cold, with a quick, weak pulse, should not be treated by bleeding, starving, and purging, like a drowsy child who is strong, plethoric, has a flushed face, perhaps swelled gums, and a heated skin. The cases which I have been describing 'may not improperly be compared to certain species of plants, by no means uncommon, which are liable to be confounded with others by an inattentive observer.'"

These remarks are cited at some length, in consequence of their marked accordance with the views, which the author has been led to entertain in what have appeared to him to be similar pathological conditions; and, he is satisfied, that both in children and adults, an analogous state of the brain is often met with, especially in scarlatina. In the disturbed state of the encephalic functions, which so often attends that anomalous disease, there may be recognized—it has appeared to him—a condition very different from that which is produced by active inflammation or congestion of the encephalon. Under the great expenditure of nervous energy, which takes place over the whole system, the

cerebro-spinal nervous centre appears at times to be in a state very different from that of inflammation or active congestion. It is rather exhausted; and, accordingly, in many such cases, the use of diffusible excitants has been found serviceable,—the delirium or the coma gradually disappearing as the system begins to feel their compensating influence. This practice was adopted in scarlatina, when accompanied by such signs of encephalic disorder, with great success, by Dr. Baer, of Baltimore; and it has been followed by happy results in some cases that have fallen under the author's own care. Under the vigorous use of depletives, the symptoms have not been mitigated; at times, indeed, they have seemed to be aggravated; but on changing the system of treatment, and having recourse to tonics or excitants, a marked amelioration has ensued.

Convulsions were, at one time, universally referred to the same condition of the encephalon as was presumed to prevail in cases of coma: blood-letting was, therefore, the remedy almost always deemed proper; yet some misgivings ought to have been produced by the well known fact, already referred to, that death from hemorrhage is preceded by convulsions.

Amongst the immediate effects of loss of blood, Dr. Marshall Hall enumerates,—syncope, convulsions, delirium, coma and sudden dissolution;—and, amongst the more remote, excessive reaction, sometimes with,—*first*, delirium, mania; *secondly*, coma, amaurosis, or deafness, and the sinking state. Convulsion, he properly considers to be, after syncope, the most familiar effect. "It constitutes," he adds, "one species of puerperal convulsion; and should be accurately distinguished from other forms of this affection, arising from intestinal or uterine irritation, and an immediate disease of the head."

The fact of the copious effusion of blood, with the attendant signs of exhaustion, will enable the practitioner to discriminate these cases, and not to premit the use of those energetic agents, which are indispensable for the safety of the patient, when the convulsions are induced by the condition of the gravid uterus modifying the due circulation of blood in the brain. It is not in such cases, that the use of the lancet does harm; on the contrary, it is the anchor of safety, and cannot be postponed. The mischief is here owing to the circulation in the brain being modified, so that the nervous system is thrown into irregular excitement; and nothing will obviate this condition, except diminishing the circulatory current. Far different, however, the author is satisfied, is the case in the generality of convulsions, which happen during early childhood. Prior to the period of the first dentition, owing to certain evolutions of organs, the nervous system—as previously shown—is unusually impressible, so that intense irritation, existing any where, may be the occasion of irritative irradiations proceeding in all directions, until the parts of the cerebro-spinal axis have their functions deranged; and sensation, volition, and mental and moral manifestations become, for the time, suspended. In this manner, the irritation produced by the pressure of a tooth against the gum, or any source of excitation in the intestinal canal, may become the cause of convulsions; and after the functions of the cerebro-spinal axis have been once deranged as they

are during convulsions, they are extremely prone to re-assume the morbid condition; until, ultimately, organic disease of the encephalon supervenes; or the little sufferer is worn out by continued irritation. In such a case, the predisposition to the disease is the period of life; and the exciting cause is the irritation in the alimentary tube. Great impressibility of the nervous system is present even in health; and this impressibility only requires the application of a sufficient exciting cause to have convulsions developed.

In addition to the general predisposition derived from time of life, there is doubtless an organization obtained from progenitors, which predisposes to convulsions. It is not very unusual for a whole family to be subject to them during childhood; and, on inquiry, it may be found, that one of the parents was liable to the same disease in childhood. In such cases, a less energetic exciting cause is able to develop the mischief, possessing, as the subjects do, a double source of predisposition. In them, we cannot suspect the existence of polyæmia, or hyperæmia of the encephalon. The phenomena are wholly neuropathic. The predisposition is unusual nervous impressibility; the exciting cause is often situate in the digestive tube; and very frequently the source of irritation is food of an improper character, or an inflammatory or other morbid condition of the mucous or lining membrane. The indication cannot, consequently, be to diminish the quantity of blood in the system, with the view of removing any supposititious congestion of the encephalon. Blood-letting, in such a state, could hardly fail to add to the impressibility of the nervous system; and it has often appeared to the author to be followed, too manifestly, by augmentation of the symptoms. The convulsions have recurred; the surface has become cool, and pale,—almost exanguious; the circulatory forces have exhibited, that their action was enfeebled; the child has continued in a state of coma between the fits, or has had but short intervals of consciousness; and has gradually sunk, with no signs of hyperæmia,—unless we consider the convulsions and the coma to indicate such a condition; for, on dissection, no morbid appearances have been met with in the brain, or an effusion of serum has been discoverable, which, as before shown, is present, when a healthy animal is bled to death.

Proceeding on those pathological principles, the author has not often considered it proper to abstract blood in the convulsions of infancy: in almost all cases, he has found it but necessary to clear the alimentary tube by a gentle emetic, followed by a mild cathartic; to keep the child from every source of irritation, that might act injuriously on the organs of sensation from without, or on the nerves of the intestinal mucous membrane from within; to equalize, as far as practicable, the excitability of the cutaneous surface by the use of frictions or of the warm bath; and, under this plan of management, he has almost always found the affection eventuate favourably. At the same time, it is proper to remark, that there are cases of convulsions accompanied by every sign of vascular excitement; and where a true polyæmic or hyperæmic condition of the brain exists. In these, of course, blood-letting is the main agent to be relied on. If encephalitis be present, it must be treated as such; but, in all cases, careful attention must be

paid to discriminate, whether the convulsions be accompanied or produced by a redundancy, or by a deficiency, of nervous and vascular energy.

If blood-letting, then, be capable of exerting a sedative agency on the organism; and yet, if carried too far, or not appropriately practised, it may give rise to all those mischiefs that follow excessive loss of blood, it becomes an interesting topic of inquiry how to regulate the operation, where it is needed, so as to have the sedative agency without any of its unpleasant concomitants, and sequelæ.

When blood is drawn in cases of internal inflammation, the great object is, by diminishing the amount of fluid circulating in the vessels, to depress the vital manifestations. But the effect of copious blood-letting, it has been seen, is exerted greatly upon the nervous system. Moreover, as already remarked, when loss of blood takes place—either naturally or artificially—to too great an extent, irregular actions are apt to supervene; and as, where hyperæmia exists, there is a part of the nervous system morbidly impressible, the vessels of the inflamed part resume their inordinate action, and the hyperæmia, after a full bleeding, is speedily reproduced; and, perhaps, to an equal degree. We have, obviously, therefore, to be careful not to carry the abstraction of blood, in such cases, to an extent that may develope irregularities of nervous action.

But this excitability varies materially according to individual organization; and to the character and intensity of the hyperæmia. There are some persons who faint at the sight of blood; and who are thrown into nervous erethism by an ordinary bleeding; whilst others bear the loss of a large amount of blood without the supervention of syncope, or seeming to suffer materially. In certain diseased conditions, again, the toleration is considerable; and a delicate female often bears a large loss of the vital fluid, when a few ounces in health, or in a different affection, would have developed great nervous impressibility. The toleration, too, varies somewhat in the same individual. Dr. Thomson says he has witnessed cases of decided inflammation, in which syncope occurred after three or four ounces of blood were taken; yet, on repeating the operation in a few hours afterwards, from twenty to thirty ounces were abstracted without the least evidence of its approach. The author has more than once had occasion to confirm this; and it is a therapeutical fact of importance,—because if we were to be deterred from repeating the blood-letting, owing to the want of toleration at the first attempt, we might deprive ourselves of the use of one of the most valuable, indeed, often indispensable, antiphlogistics; yet, it appears scarcely philosophical, that in a case of excited organic actions of a part,—say, of the pleura, or peritoneum,—we should take away blood from the arm; or, in other words, from the whole system, in order to reduce the overaction of a part. We have no mode, however, of reaching the affected vessels,—no mode of applying our remedies to the parts concerned,—and are compelled to act on the diseased organ through the influence which we are capable of producing on the nervous system generally, as well as through the diminution in the supply of fluid to the inflamed part, which must necessarily result from the operation.

From the great amelioration of the symptoms of inflammation, generally observed when syncope is induced from any cause, it has been deemed important, that blood-letting should always be pushed so far as to make this decided impression on the system; and there are some who regard its supervention as an evidence that the operation has exerted its full effect, although a few ounces only may have been abstracted. The author recollects a case in which fainting was occasioned by the awkward and abortive attempts of a bungling provincial practitioner in France; yet it was regarded by him to be as effectual for the removal of the hyperæmia, for which it was employed, as if twenty or thirty ounces had been taken before the occurrence of syncope. The state of fainting is one of suspended animation,—of suspension of the great vital functions,—and, therefore, one in which there must be a truce to the various excited actions, that may be going on in any part of the organism; but the effect is only temporary; and, as soon as the functions of respiration, circulation, and innervation are restored to the normal condition, the signs of hyperæmia may be as manifest as before. By many, indeed, syncope has been compared to the cold stage of an intermittent; and reaction, it is conceived, is as sure to follow as the hot stage succeeds to the cold stage of a paroxysm of that disease.

“The morbid effects of large depletions,” says an able writer and observer, Dr. Copland, “will necessarily vary with the nature of the disease in which they are employed. When carried too far, in case of excitement, where the nervous or vital power is not depressed, and the blood itself rich or healthy, reaction generally follows each large depletion, and thus often exacerbates or brings back the disease for which it was employed, and which had been relieved by the primary effects of the evacuation. This is more remarkably the case in acute inflammations of internal viscera, particularly of the brain or its membranes. Thus, every observing practitioner must often have noticed, that a large depletion, when carried to deliquium, will have entirely removed the symptoms of acute inflammation when the patient has recovered consciousness; and that he expresses the utmost relief. But it generally happens that the inordinate depression—the very full syncope that is thought essential to the securing of advantage from the depletion—is followed by an equally excessive degree of vascular reaction, with which all the symptoms of inflammation return; and the general reaction is ascribed entirely, but erroneously, to the return of the inflammation, instead of the latter being imputed to the former, which has rekindled or exasperated it, when beginning to subside. The consequence is, that another very large depletion is again prescribed for its removal; and the patient, recollecting the relief temporarily afforded him, readily consents. Blood is taken to full syncope,—again relief is felt,—again reaction returns,—and again the local symptoms are reproduced; and thus large depletion, full syncope, reaction, and the supervention on the original malady of some or all of the phenomena described above as the consequence of excessive loss of blood, are brought before the practitioner, and he is astonished at the obstinacy, course, and termination of the disease; which, under such circumstances, generally ends in dropsical effusion in the cavity in which the affected organ is lodged; or in

convulsions, or in delirium running into coma ; or in death, either from exhaustion or from one of the foregoing states ; or, more fortunately, in partial subsidence of the original malady, and protracted convalescence. Such are the consequences which but too often result,—which I have seen on numerous occasions to result,—when blood-letting has been looked upon as the only or chief means of cure—the ‘*sheet-anchor*’ of treatment, as it too frequently has been called and considered during the last twenty years.”

To prevent this reaction, Dr. Copland directs the following course of practice, when large blood-lettings are required in the treatment of visceral inflammation. The patient should be either in bed or on a sofa, and in the sitting or semi-recumbent posture, supported by several pillows. The blood is to be abstracted in a good sized stream ; and the quantity should have some relation to the intensity and seat of the disease, and the habit of body and age of the patient, but chiefly to its effects: it should flow until a marked impression is made upon the pulse, and the countenance begins to change. Farther depletion must not now be allowed ; but the finger should be placed on the orifice of the vein, the pillows be removed from behind the patient, the recumbent posture be assumed, and the arm secured. “Thus, a large quantity of blood may be abstracted, when it is required, without producing full syncope, which should always be avoided: and when a large loss of this fluid is either unnecessary, or might be hurtful, the speedy effect produced upon the pulse and countenance by the abstraction of a small quantity will indicate the impropriety of carrying the practice farther. In this manner I have often removed about forty ounces of blood, where large depletion was urgently required, before any effect was produced upon the pulse, but always carefully guarding against syncope ; and by the subsequent means used to prevent reaction, no farther depletion has been required.”

The “means” alluded to, consisted of contra-stimulant doses of tartrate of antimony and potassa ; of full doses of calomel, antimony, and opium ; or opium singly, &c. &c.

There can be little doubt, that the course here recommended is judicious. The author has already remarked, that in many nervous individuals, syncope may be induced, even before the blood flows, or when a very small quantity has been discharged. In such case, everything is favourable for the occurrence of violent reaction ; and no good is to be expected from the temporary sedation effected during the syncope. The exaltation of the vital forces, to be permanently subdued, generally requires a copious abstraction of fluid from the vessels, and by keeping the patient in the horizontal attitude, and waiting for a time,—pressing the finger on the vein when signs of syncope appear, and, after they have passed away, removing the finger from the bleeding orifice,—blood enough can generally be withdrawn to produce the necessary effect. At other times, the loss of very large quantities of blood is borne without the supervention of any evidences of syncope, and when there has been great reason to believe that the *toleration* would continue, until a slight additional abstraction of blood might induce a state of irretrievable collapse,—or, what Dr. Marshall Hall has called—“the sinking state.”

In the lectures of Mr. Lawrence, as given in the London "*Lancet*," is contained the case of a young female, of slender habit, from whom eight-and-forty ounces of blood were taken away without fainting. The blood still continued running in a vigorous stream without touching the surface of the arm; and it was stopped at that amount only because the quantity seemed to Mr. Lawrence to be so very great. In a case like this, it would not be right to continue to bleed until signs of syncope ensue. When the practitioner has bled to thirty, or at the farthest, to forty ounces, it would, perhaps, be wise to tie up the arm; to pursue the sedative system by a full dose of opium,—and there is none so good in the vast majority of cases, where patients tolerate it,—or of some other sedative agent; and if, in the course of three or four hours, the mischief, for which the blood-letting was practised, be not subdued, to repeat it.

The interesting fact was pointed out by Dr. Marshall Hall, that in inflammatory diseases, a much larger amount of blood may be drawn without inducing syncope than can be done in health, or in other diseases. The following table is the result of that observer's investigations in regard to the tolerance of blood-letting in different maladies. The numbers represent the mean quantity of blood which flows before incipient syncope in the sitting or erect attitude.

I. AUGMENTED TOLERANCE.

Congestion of the brain	3xl—l.
Inflammation of serous membranes	} 3xxx—xl.
Inflammation of synovial membranes	
Inflammation of fibrous membranes	
Inflammation of the parenchyma of organs (brain, lung, liver, mamma, &c.)	} 3xxx.
Inflammation of skin and mucous membranes (erysipelas, bronchitis, dysentery, &c.)	
	3xvj.

II. HEALTHY TOLERANCE.

This depends on the age, sex, strength, &c., and on the degree of thickness of the parietes of the heart, and is about	3xv.
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III. DIMINISHED TOLERANCE.

Fevers and Eruptive Fevers	3xij—3xiv.
Delirium tremens and Puerperal Delirium	} 3x—xij.
Laceration or concussion of the brain	
Accidents before the establishment of inflammation	} 3viii—x.
Intestinal irritation	
Dyspepsia, Chlorosis	3viiij.
Cholera	3vj.

The explanation of the increased tolerance of blood in inflammation, Dr. C. J. B. Williams apprehends, is to be found in the increased excitability of the heart, and tonicity of the arteries, which maintain a sufficient force and tension to preserve the circulation, especially through the brain, even when much blood is lost. "In asthenic or atonic diseases, on the other hand, the arteries being lax, and ill-fitted to transmit the blood, a smaller loss is felt, and syncope may result. The variations between inflammations occupying different seats must be referred to the arterial tone being less augmented in some than in others, and are therefore indications of the more or less sthenic character of the inflammation. The quantity of blood in the whole system will affect the heart's action, and arterial tension in a similar way; and no doubt the more stimulating quality of the blood may contribute to the same results."

The extent to which blood-letting should be carried, in cases of violent internal inflammation, is often a matter of great difficulty with the discriminating, but of none whatever with the reckless and uninformed. In his state of blissful ignorance, the latter continues to bleed; and consoles himself, when the fatal result has been hastened—perhaps mainly induced—by his agency, that the sufferer has fallen a victim to an incurable malady.

Many have laid down a rule, before referred to, that when blood-letting has been carried to such an extent, and so often, that we are in doubt whether it should be repeated, the decision should be in the affirmative. But with the disposition, which prevails so generally,—and which prevailed, a few years ago, to a much greater extent than it does even at present,—to bleed without due consideration, such a doubt will rarely be felt, without good ground at the same time existing for staying the hand; and, therefore, the decision, according to the author's experience, ought generally, as before said, to be in the negative. The argument, commonly urged for the further abstraction of blood, is, that the inflammation manifestly persists, and that it must inevitably destroy if it be not arrested;—that blood-letting is more likely to subdue it than any other therapeutical agent; and that, if it should not, the physician will have the consolation of knowing, that he has done everything in his power to avert the melancholy termination. Were the abstraction of blood in all cases, and to any extent, devoid of danger, this mode of viewing the subject might be logical; but mischiefs result in these and similar cases, which are fairly referable to it; and are equally serious in their results with the disease for which it may have been employed. Often, too, whilst the practitioner is taking away blood, he allows the patient to drink freely of water or other fluid, and, under the augmented absorbent agency induced by the diminution of the quantity of blood in the vessels, a state of anæmia or oligæmia supervenes; and the blood is rendered so thin, that if the disease, for which repeated blood-letting was adopted, be hemorrhagic, and the hemorrhage be owing to transudation through the parietes of the vessels—as is almost universally the case—the recurrence of the hemorrhage is greatly facilitated. In an early part of this volume, the author has referred to an interesting case of anæmia, produced by excessive bleeding in what was supposed to be

periodical encephalitis ; and to the mischiefs so manifestly referable to an inadequate quantity of blood circulating in the vessels, as well as to the impoverished condition of that fluid ; and, to a minor extent, similar evils are often found to result from the same causes, although they are too frequently not appreciated, or, if appreciated, regarded as inevitable. Whenever anæmia of the kind referred to exists, the excitability of the nervous system is irregularly developed ; hyperæmic affections are apt to arise in various parts, which seem formidable, and yet require a very different mode of management from such as are met with in those who are plethoric, or whose blood is rich in fibrin and red corpuscles.

It must be borne in mind, too, that the researches of MM. Andral and Gavarret have established the fact, that the chief effect of loss of blood is to diminish the ratio of the corpuscles to the fibrin,—a statement, which the researches of MM. Simon, Becquerel and Rodier, and others have confirmed. As blood is abstracted, the fluid becomes impoverished, and more watery ; whence the density of defibrinated blood diminishes notably. The albumen also decreases ; but usually only slightly ; hence the diminution in the density of the serum is small. The fibrin is uninfluenced by venesection ; the extractive matters and free salts are unaltered ; the fatty matters are slightly lessened ; the serolin, always variable in quantity, is decidedly increased in some cases ; the cholesterin appears to be but slightly increased ; the chloride of sodium and other salts remain unchanged ; and the iron is diminished slightly in the same proportion with the corpuscles. It would appear, therefore, that blood-letting influences but little the main morbid condition of the blood in inflammation,—the increase in the ratio of fibrin to red corpuscles. Its beneficial effect must consist in reducing the density of the fluid, and, therefore, facilitating its circulation through the obstructed or hyperæmic vessels.

It was a remark of the distinguished Laënnec, that the strength of the pulsation of the heart under the stethoscope is an excellent guide for the use of the lancet. “In all cases,” he says, “in which the pulsations of the heart are proportionately more energetic than those of the arteries, we may bleed fearlessly ; and be certain of an improvement in the state of the pulse. But if the heart and the pulse be alike feeble, blood-letting will almost always precipitate the patient into a state of complete prostration ;”—and he adds:—“the certainty and facility with which the stethoscope affords or excludes the indications for blood-letting appears one of the greatest advantages conferred by this instrument.” This is doubtless a good general rule ; but account must be taken of exceptions in nervous and hysterical subjects, in whom palpitations may exist, and a temporary increase of force be detected under the instrument. It must be recollected, too, that in certain serious maladies, as enteritis, the pulse may be slow and feeble ; whilst in inflammatory affections of infinitely less moment—as amygdalitis,—it may be strong and bounding ; and again, as previously remarked, in reaction from positive exhaustion, as after loss of blood, the excited state of the heart and arteries may deceive at first the experienced practitioner.

Mere quickness of pulse, taken singly, can never be regarded as a positive indication for the use of the lancet, inasmuch as it occurs in diseases which are highly neuropathic, especially where they are accompanied at the same time by debility; and it is almost always present in approaching dissolution. The practitioner, consequently, who expects, under such circumstances, to diminish the velocity of the circulation by blood-letting, will find himself mistaken. In scarlatina, quickness of pulse is one of the most marked functional phenomena, and in the most malignant cases this quickness is often most striking; yet blood-letting can rarely be employed in such cases; and if it were, it would generally be found, that the quickness of pulse would be increased rather than diminished by it.

Formerly—not many years ago, indeed—it was laid down, by many, as a rule of guidance, that in a case of internal inflammation, blood-letting ought to be repeated so long as the blood drawn exhibits a buffy coat; but this is a rule now properly abandoned. It is clear, indeed, from the results of observation, that, in some cases, it would exhibit this character immediately before the occurrence of fatal syncope. But the buff is not perceptible in cases of high internal inflammation only; it is met with in acute rheumatism, in the pregnant condition, in chlorosis, and, at times, in persons of great nervous excitability. In the *first* of these cases, there is no disorganizing inflammation present,—none, that requires the same activity of treatment to preserve life, which pleurisy, for example, does; and, in the *second*, the buff appears, when the female is in health. (Vol. i. p. 49.) Perhaps, however, the most important of the facts to be borne in remembrance is the *third*—that we observe it in the blood of persons of high nervous excitability, even when no inflammatory condition is present; and when, on the contrary, the blood is watery,—or does not contain the healthy proportion of solid constituents. Such cases give rise to great hesitancy and difficulty in the mind of the practitioner, when signs of hyperæmia exist in an internal organ. The author attended a case of the kind, in company with Dr. Gibson, of Baltimore. The subject was an amiable and gifted young lady, whose temperament might be regarded as eminently nervous or impressible. She had been labouring under pain on breathing; but without much cough: the skin was, at the same time, hotter than natural,—decidedly so at some periods of the twenty-four hours; and the mucous membrane of the tongue, although moist, was coated, and indicated the existence of internal hyperæmia. She had been judiciously treated: blood had been taken; and counter-irritation established, both on the region of the chest and in the secretory system in general; for the mouth had been slightly affected by mercury. A day or two before the author saw her, she had expectorated, in the morning, blood, which was florid, but not frothy, and was not brought up by any effort of coughing. At his first visit with Dr. Gibson, it was proposed that blood should be drawn, not so much in consequence of the presence of urgent symptoms, but from the apprehension, that the affection, which appeared to exist mainly in the pleura costalis, might extend; whilst, at the same time, a knowledge of her temperament, and the character of her symptoms, suggested, that the abstraction should be practised

with caution. The blood, previously drawn, was buffed; and this was regarded as one element in the decision that a farther abstraction should be made. She was accordingly bled; the blood was again buffed; but the crassamentum was small in quantity, and very thin; so that it could be laid hold of, and separated from the large amount of serum in which it was placed, and be held up like a piece of leather. Only a small quantity of blood was taken; and yet the depression produced by it was urgent, and sufficiently demonstrated the propriety of the great caution that had been exercised in the employment of the lancet. The pain was, however, entirely relieved; and, by keeping up a centre of irritation, by means of the ointment of tartrate of antimony and potassa applied on the exterior of the chest, the symptoms were entirely removed. For this fortunate termination she was mainly indebted to the discrimination of her attending physician; for had he carried the blood-letting farther, prostration would have ensued to a much greater extent; a corresponding reaction would have been established, and any hyperæmia that might have existed would probably have been increased; yet, if the buffy coat of the blood were to be regarded, in all cases, as unequivocal evidence that a farther abstraction of that fluid should be made, it ought assuredly to have been practised in this case. In the case, too, of affection of the encephalon, which the author described as having attended with Professor Smith, (p. 154,) the blood exhibited the buffy coat; yet its abstraction, even in small quantity, induced violent palpitation and other nervous phenomena that prevented its repetition.

It may be affirmed, then, as a rule, that the appearance of the buffy coat cannot, when taken singly, be esteemed a sufficient reason for the farther abstraction of blood; that the propriety of a repetition must depend upon other symptoms taken along with the buffy coat; and farther, that such a coat may be present, when there is no concomitant inflammatory condition, or when it is by no means to a dangerous extent.

The general views that have been laid down with regard to the use of blood-letting, will have demonstrated the value of this therapeutical agent in inflammatory affections; and the circumstances that must be taken into consideration in judging of the extent to which the abstraction of blood must be carried, and of the best mode of after management for reaping full advantage from it, where it may have been employed as far as the practitioner has deemed prudent, and yet where hyperæmia may still exist. Such cases require the nicest discrimination; yet blood-letting has been so much the fashion in all diseases of an inflammatory character, and—it may be said—in all sudden diseases, that the public voice calls loudly for the lancet; and the practitioner, led away by popular clamour, and not sufficiently fortified by the possession of sound pathological and therapeutical principles, falls in too frequently with the wishes of bystanders, who are commonly totally ignorant of the proper course to be pursued. If, too, he be not possessed of right presence of mind, he may adopt measures of which his better judgment may by no means approve.

On a public occasion some years ago, in an address delivered to the Graduates in Medicine at the annual commencement of the University

of Maryland, the author had an opportunity of adverting to some cases of this kind, that are of daily occurrence. A man falls from a height, bruised—stunned perhaps—and the general call is for a surgeon to bleed him; yet, in many of such accidents, a shock is given to the great nervous centres—the brain and spinal marrow—the effects of which bleeding is well calculated to augment—and augment fatally—if employed immediately after the receipt of the injury, and before reaction has taken place. In like manner, if a person, when vehemently addressing an auditory, falls down suddenly deprived of animation, the impression immediately is, that he has had an apoplectic seizure. A vein in the arm or neck, or the temporal artery, is immediately opened, and the state of suspended animation may thus be converted into one of death. The heart, in such cases, has ceased to act, and the free abstraction of blood from the general circulation may not be well adapted to restore it.

When a person is attacked with apoplexy, it rarely happens that he dies instantaneously. A train of phenomena, characterized by loss of sensation, volition, and mental and moral manifestation, succeeds for a time; and is the precursor of dissolution. Circulation and respiration, in the meanwhile, continue; but, where the heart dies first, the circulation ceases; respiration is no longer accomplished, and the state of suspended animation becomes converted, almost instantaneously, into positive death. This view has been confirmed by the cases of instantaneous death, which the author has had an opportunity of examining. In most of them, the state of the heart has indicated, that the cessation of its action was the first link in the chain of phenomena.

The satisfaction often felt at the exhibition of energy on the part of the practitioner is well exemplified by an anecdote, which an illustrious native of this country—now no more—who had filled the highest office in the gift of a free people, and whom the author had the honour of ranking amongst his personal friends—was in the habit of recounting. Travelling from Virginia towards the north, he rested for a night at a tavern on the road. Soon after his arrival, the hostess came in from a neighbouring house with the females of her family,—all exhibiting marks of deep distress. He was informed, that they had been witnessing the parting scene of a young friend, who had died of some acute affection. “But, thank God!” observed the contented matron, “every thing was done for him that was possible, for *he was bled seven-and-twenty times.*” “It is not”—says the inimitable Molière, who was unsparing in his appropriate philippics against the profession, and the public of his day—“it is not, that, after all, your daughter may not die; but, at all events, you will have done something, and you will have the consolation that she died according to form.”

After the lecture, to which allusion has been made, was delivered, the author's friend, Dr. Wright, of Baltimore, put into his hands a work published by him upwards of thirty years ago, which, in an appendix, contains views so strikingly like those which the author promulgated on that occasion, that they might be regarded as the prototypes of his. Dr. Wright's excellent ‘*sketch*’ had not previously, however, fallen under his observation; the coincidence of views is, therefore, accidental,

and it afforded the author no little satisfaction to find, that his sentiments accorded so strikingly with those of so excellent an observer. The appendix contains a masterly critique on the views of Dr. Rush, as contained in his '*Defence of Blood-letting.*'—" 'We must do something,' is the most unfortunate and pernicious maxim," says Dr. Wright, "which has ever been introduced into the policy of medicine. At the moment, when it received the sanction of professional reputation, professional imposture was legalized, and ignorance and artifice acquired confidence from feeling security. I refer to no particular authority for the inculcation of this sentiment. It has unhappily been stamped with the approbation, and received the connivance of numbers, who could have wanted nothing but reflection to have refused it their assent. Its adoption has never wanted advocates; it has been eagerly received, and amply exercised; and the profession is to this day disgraced by the admission, that 'mankind must be amused.' Had half the pains been taken to acquire professional understanding, which have been practised to impose on society, this maxim might long since have been commuted for the more honourable sentiment, that mankind must be instructed. It is under the covert of this professional mask, that the prejudices of the world have been pressed into the service of the practitioner, and its ignorance arrayed against its security. It is thus that a convenient resource has been provided against that false shame, which dreads a candid avowal; and the physician, armed with implements, for whose use or consequence he apprehends no responsibility. Among the weapons of this licensed warfare against decorum and integrity, the *lancet* holds a distinguished rank. Like the sword of Alexander, it is the universal solvent of every difficulty; and has often been made to sever the gordian knot, which defective ingenuity was incompetent to unravel. Justice would be violated were those remarks pointed solely at the worthless herd, whose business is imposture; who openly repose their claims upon the hopes and fears, the follies and the weakness of their fellow creatures. They reach even him to whom contingent circumstances have opened a more ample and elevated range in professional relation; who, without an effort to improve that profession, is solicitous to enjoy, by other means, the benefits of its exercise."

The whole of Dr. Wright's remarks on the subject of blood-letting as a therapeutical agent are judicious; and it is a matter of regret, that, owing to the exhaustion of the copies, the work is not available to the profession. It is to be hoped, however, that he may find leisure to lay before it the substance of the appendix to which the author has referred, with the modifications—if any—that have been suggested by his subsequent observation and reflection.

Allusion has more than once been made to the induction of syncope, as marking the effect produced by blood-letting on the functions; and this is the criterion established by many practitioners, as to the requisite quantity of blood to be abstracted in cases of internal inflammation. In general, no harm may arise from the rule, but there are exceptions to this, as well as to all other rules. Fortunately, the condition of inflammation impresses a degree of tolerance on the system, which, in the vast majority of cases, enables it to withstand the abstrac-

tion of blood, even when carried to an injudicious extent; but in extreme ages—in early infancy, and in advanced life—the frame does not rally so readily from the sedation; and the author is satisfied, from actual observation, that many persons at those ages have had their deaths hastened—if not mainly occasioned—by the too vigorous use of blood-letting. This is especially apt to occur in diseases, in which the degree of inflammatory irritation is not so great as to communicate to the system the full tolerance; and especially in those cases of coma or convulsions in early childhood, to which reference was previously made, as being presumed to depend on “*congestion*,” and, therefore, to require blood-letting. In these unhappy cases, the fancied signs of congestion increase after the operation; the farther abstraction of blood is, therefore, determined upon; the powers of life fail; effusion takes place into the ventricles, and the child dies from exhaustion,—that exhaustion having been partly induced by the means adopted for the removal of the malady. Such is not, however, in all probability, the opinion of the practitioner. He consoles himself with the reflection, that the fatal event has been occasioned by the intensity of the disease. When a similar state of affairs occurs, he has, consequently, recourse to the same management, with like results; and, at the end of a long life, he is perhaps ready to exclaim,—that he has never had occasion to regret the employment of blood-letting, but has often reproached himself for not having pushed it farther.

All this has arisen from the indiscriminate faith, placed in this valuable agent—valuable only when appropriately employed—by others besides the Sangrado of Le Sage. “With regard to age,” says Professor A. T. Thomson,—“in infancy, the laxity of the solids, and the relative proportion of the serum or watery part of the blood to the crassamentum or clot, which consists of fibrin, and colouring matter, are more considerable than in adult age: blood-letting, by increasing this greater proportion of serum, proves hurtful; and a state of syncope in infants is always one of great danger. The first effect of exhaustion in such young subjects is an increased degree of irritability, which leads to stupor, and generally terminates in convulsions; the pulse is quickened, the pupil of the eye dilates, and symptoms closely resembling those which precede the effusion of water in the ventricles present themselves. I have seen this more than once occur in children in whom symptoms resembling those of inflammation of the brain, accompanying irritation of teething, have displayed themselves; and leeching or cupping has been resorted to; but, instead of affording relief, a state of evident defective stimulus supervened; and, in one case, snoring, stertor, and other appearances of apoplexy having followed the bleeding, more leeches were applied, and the infant died. This state is detected readily by attention to the state of the breathing, which seems to be performed almost wholly by the diaphragm; and is always accompanied with the evolution of much flatus; both circumstances denoting a very low state of the nervous energy. It is best obviated by white wine whey, opium and ammonia, administered warm, in small quantities, and frequently repeated. In youth, and in the vigorous and robust, on the contrary, reaction takes place, and is especially marked after re-

peated venesections. The most favourable age for bearing blood-letting is from eighteen to forty-five. In old people the reaction is extremely feeble; and, during the flow of the blood, exhaustion often steals on so insidiously and imperceptibly, that when nothing injurious is anticipated, syncope appears; no reaction can be induced, or it is defective, and gives way to a state of positive sinking. The risk in such a case is extreme."

The dangers conceived to arise from general blood-letting, in early childhood, are considered by some so great, that they never have recourse to it, preferring leeches or cupping; but, provided it be carefully practised, it is safe, and the impression made upon the diseased condition—if one of active inflammation—is usually more decidedly salutary. The abstraction should not, however, be carried so far as to induce syncope. Owing to one or more fatal events having succeeded to the operation in Edinburgh, the Professors,—during the author's attendance on the lectures there,—were in the habit of inculcating excessive caution in regard to its use at that early age. "The experience of fifteen years, and some of it of a sorrowful kind"—says Dr. Casper Morris, of Philadelphia, "has convinced me fully, that children bear bleeding *illy*, and in asserting my convictions that as many children have sunk under the ill-judged use of depletion as from incurable disease, I would not cast censure upon others without taking to myself a full share of it." In his recent "*Essays on Infant Therapeutics*," (New York, 1849), Professor J. B. Beck has urged great caution in the use of this agent in such cases; *first*, on account of the young subject not bearing the loss of considerable quantities of blood as well as the adult; *secondly*, on account of the nervous system being more powerfully affected by the loss of blood; *thirdly*, on account of the repetition of blood-letting not being so well borne; and *fourthly*, because the effects of local blood-letting, especially leeching, on the child are different from what they are on the adult. In the latter, the effect of leeching is in a great measure local, and it is not usually resorted to, until after general blood-letting is considered inadmissible. In a child, on the contrary, it produces very much the same effect as general blood-letting.

Of the propriety of caution in advanced life, the author had a striking instance soon after he commenced practice. It was, indeed, of so alarming a nature, that it could not easily be forgotten. An elderly gentleman was directed to be bled for chronic bronchitis, and the author was requested to perform the operation. After the abstraction of a few ounces, syncope rapidly supervened; and it was so long before the vital functions were restored, that he became seriously apprehensive the patient would die under his hands. He ultimately recovered; but a considerable period elapsed in this stage of exanimation or transition between life and death. The same caution is requisite in taking away blood when there is chronic disease of the heart or great vessels. The author has known two cases, in which the syncope, induced by blood-letting practised for the removal of symptoms of internal hyperæmia, became the syncope of death; the irritability of the heart seemed to be suddenly destroyed, and it never resumed its pulsations. In one of the cases, the existence of organic disease of the heart was known; but the

individual seemed as if he could tolerate a copious abstraction of blood; before, however, a few ounces had been taken, he fell from his chair, and expired. In such doubtful cases, the patient should be placed in the horizontal posture, and the flow of blood be arrested, before any decided effect appears to be exerted upon the functions of innervation or circulation.

Such are some of the main points to be borne in view in the employment of general blood-letting as a therapeutical agent, in inflammatory affections especially. There are cases, however, in which our object is to bleed to positive syncope—to relaxation—and where we have no fears of reaction; as where we are desirous of resolving forcible muscular contraction, or of reducing strangulated hernia. With this view, the patient is placed in a sitting posture, and the blood is made to flow from a free orifice in one or both arms.

Again, there may be cases,—as already remarked,—in which general bleeding may be unadvisable; and yet where topical bleeding may be advantageous. There was a time—indeed, the feeling still exists with a few—when it was maintained, that there can be no case in which topical blood-letting appears to be required, which could not be relieved, and more effectually, by blood drawn from the general system; and certain practitioners have gone so far as to express their regret, that such agents, as a leech, or a scarificator and cupping-glass were ever known. There is, here, probably, defective observation—modified, perhaps, by the existence of ancient and preconceived opinions—which interferes with the correct observation and reflection of the practitioner. The author has repeatedly satisfied himself, that local abstraction of blood has produced the most beneficial results, when general blood-letting had been—or would, to all appearance, have been—entirely ineffectual. In many of these cases, however, the beneficial result was probably not owing so much to the blood drawn, as to the attendant revulsion,—a *modus operandi* of blood-letting, general as well as topical, which is considered elsewhere. (See REVELLENTS.)

It has been a common remark, that local blood-letting—when not used as a revellent, but simply with the view of diminishing the quantity of circulating fluid, and of acting, in this way, on the powers of the system—is inefficient, and cannot be relied on when internal inflammation is present; but this is an erroneous position. By multiplying the number of cups, or leeches, we can as certainly, although not always as effectually, reduce the organic actions, as by opening a vein; but the blood flows more gradually, and is, consequently, adapted for cases where venesection might not be appropriate. Every practitioner, who has employed leeches freely, must have met with cases, in which the most decided effects were produced by the depletion, which they occasioned. Each good American leech, if we reckon the quantity of blood that may be encouraged to flow from the leech-bites, may be regarded as withdrawing a third of a fluidounce of blood; and, consequently, if we apply as many leeches as some of the modern French practitioners were in the habit of prescribing in gastro-enteritic, and other inflammatory diseases, we may take away a larger quantity of fluid from the ves-

sels than we could do with impunity from the vein of the arm. Twenty or thirty ounces constitute a large bleeding; and it will rarely happen that the lesser quantity can be taken from a vein without the supervention of syncope, and the inconveniences, which in particular habits, are apt to follow that state; whilst a much larger quantity can be abstracted under the gradual flow that takes place either when leeches or cups are the agents. An experienced leecher of Baltimore informed the author, that there is not much difference in the quantity of blood, which the American, the Turkish, the German or the Spanish leech can contain. This may be estimated at about a quarter of a fluidounce; but they differ essentially as respects the flow they occasion from the bites. By the Turkish and the German, a fluidounce may be lost, including the quantity swallowed by the leech; and by the Spanish, half an ounce; whilst we can scarcely calculate on more than a third of an ounce from the American.

It has fallen to the author's lot to witness some alarming cases of exhaustion, especially in children, where leeches had been applied; in two, indeed, the result was fatal. In both, due attention had not been paid, and a large amount of blood was lost before the cause of the sinking was discovered; and in one, every attempt to arrest the flow of blood failed. These cases are rare; but they constitute objections to the use of leeches, which do not apply to cupping,—the flow from the wounds made by the scarificator being more readily arrested. When practicable, the leeches should be placed over bone, in order that pressure may be conveniently made on the bleeding vessels, should such a course be requisite. "From the greater vascularity of the skin"—says Dr. J. B. Beck—"the amount of blood lost by a leech, applied to a young subject, is much greater than in the adult, and it is frequently much more difficult to arrest the hemorrhage from it. The general effect, then, of leeching on the young subject, is much greater than upon the adult. Hence it is, that cases are so frequently" [?] "occurring in which children die from leeching. Of this we have numerous cases on record."

"When leeches are applied to soft parts,"—says Dr. A. T. Thomson—"for instance, to the abdomen, it is truly astonishing how much blood sometimes is detracted; particularly when a poultice is applied over the bites, and the patient is kept warm in bed: to prevent, therefore, injurious symptoms of exhaustion from such a circumstance, the poultice should be frequently examined. This is more likely to occur in children than in adults; and in children it not unfrequently happens that the bleeding cannot be stopped without encircling the orifice of the ligature. On this account leeches should never be applied late at night on children; for, as the application of leeches in infancy must be regarded as a species of general blood-letting, the precise number which will regulate not only the quantity, but be equivalent to rapidity in the detraction of the blood should be determined; but the bites should be instantly closed, on observing that the system is brought under the influence of loss of blood."

In all cases of hyperæmia, occurring in the child, or in the adult, the

therapeutist will have to exercise the best of his judgment as to the propriety of the adoption of general or local blood-letting, or both.

It is not a true position, then, that general can always be substituted for local blood-letting with equal advantage ;—nor does the converse of the proposition hold good. Both general and local blood-letting diminish the quantity of fluid circulating in the vessels ; they are both, therefore, adapted for cases of polyæmia or plethora, although the former is more available than the latter where copious abstraction of fluid is necessary ; but general blood-letting is not adapted to every case of hyperæmia. In some cases, a small quantity of blood, obtained from the inflamed part itself, affords instantaneous relief, when general bleeding has been used in vain ; and there are cases, again—as has been shown, when treating of EXCITANTS—that are relieved by stimulating the vessels to contraction, after both local and general blood-letting have failed.

It must be borne in recollection, that inflammation is not caused directly by the condition of the general circulation, but by a morbid state of the capillary vessels of a part. Inflammation may attack the arteries and veins themselves ; and even this is not, or need not be, connected with the state of the blood in the inflamed vessels, but is dependent upon a morbid condition of the nerves and vessels that supply their coats. Blood-letting, consequently, even in this case, can be but an indirect agent. By diminishing the amount of circulating fluid, it may reduce the activity of the capillary vessels, and thus remove the hyperæmia ; but it exerts no direct sedative agency on the vessels themselves. Such is the fact in every case of inflammation. The action of the capillaries is distinct from that of the heart ; and—as before remarked—inasmuch as inflammation is produced by a morbid condition of the capillaries, the most philosophical plan of medication would be, to direct our remedial agents to those vessels ; but as this cannot always be effected, we are compelled to have recourse to the only succedaneum we possess—the abstraction of blood from the general system, and the sedation which this is capable of effecting.

In diseases of certain parts of the organism, we have a choice of vessels so as to enable us at times to empty the affected capillaries, or to reduce the quantity of blood, or, in other words, the *amount of stimulus* in them, more effectually ; but our sphere of action, in these cases, is extremely limited ; and perhaps in internal inflammation null. It can be understood, that if hyperæmia were present in the hand,—blood, taken from the bend of the corresponding arm, would empty the vessels concerned more freely than if it were taken from the other arm, or from the external jugular ; but in hyperæmia of an internal organ, we have no mode of opening a vein passing between the inflamed part and the heart. It has, indeed, been recommended, under the views here laid down, that blood should be taken, either from the temporal artery, or from the external jugular vein, in cases of inflammatory affections of the encephalon ; yet slight reflection will show, that no signal advantage can be expected from this course ; and, indeed, plausible arguments might be advanced to prove, that the disadvantages might overbalance the presumed benefits. For example, blood, in every case of the kind, where the artery is opened, must come from the external

carotid—a vessel which does not supply the encephalon—and, consequently, it cannot be supposed, that any benefit could accrue from selecting that vessel in a case of encephalitis. It may be argued, however, that if more blood be solicited into the temporal artery, less will pass along the internal carotid ; but this argument, again, might be combated—and philosophically—under the view, that as both the internal and external carotids arise from one trunk, any cause, that would solicit blood into the one, might attract a larger afflux along the common trunk ; and, therefore, augment the flow into the other.

The same reasoning applies to phlebotomy practised upon the external jugular vein in head diseases. If we could open the internal jugular, we might assuredly materially affect the state of the encephalic vessels, by emptying the sinuses, which, by their union, constitute that vessel, or rather supply it with blood ; but this is impracticable ; and, as the external jugular conveys the blood back to the subclavian from the exterior of the head only, no advantage can accrue from selecting it, where the encephalon is in a morbid condition.

It has been proposed by many, that a branch of the temporal artery should be opened in cases of violent ophthalmia ; but the proposition has probably been hazarded without due examination. If we could always take blood from the ramifications that proceed towards the eye ; and, after the blood-letting, destroy them, by cutting them across, the plan might be advantageous ; but unless we divide those very branches, the effect may be anything but salutary. By obliterating some of the arterial ramifications, more blood may be distributed to the others ; and, in this way the ophthalmic branches may become developed, and more mischief than good accrue from the operation. Owing to these objections, arteriotomy is not often had recourse to in such cases : it is rarely, indeed, employed, except in sudden seizures, as of apoplexy ; and then rather on account of the ease with which it can be accomplished—in the absence of bandages, &c.,—than in consequence of any therapeutical preference, which should be given to this mode of abstracting blood. It is an important fact, moreover, connected with this inquiry, that the experiments of M. Poiseuille with his hæmadynamometer have shown conclusively, that the pressure of the blood in the different vessels is alike, and consequently, that the tension can be relieved as effectually by taking blood from one vessel as from another.

The essential difference, after all, between topical and general blood-letting, is, that by the one we abstract blood from the capillaries ; by the other, from the larger vessels. Now, in internal inflammation, topical blood-letting cannot be employed on the vessels of the part : it must be effected at a distance from the seat of the mischief ; and, accordingly, its operation is of a mixed character—combining depletion and revulsion ; but in external inflammation, we can make our depleting agents affect the vessels themselves, that are morbidly implicated. With this intent, cupping is rarely used. The operation cannot well be borne on an inflamed surface, owing to the pressure of the cups. Scarifying the part is, however,—in diffusive inflammation especially,—a most energetic agent ; and half an ounce of blood, discharged from the over distended vessels, is followed by more benefit than all other

remedies together. Mr. Lawrence has well shown the marked utility of free scarifications through the integuments in the diffusive inflammation of the skin, which constitutes erysipelatous inflammation; and in the varieties of erythematous inflammation of the fauces, which are attended by deep dusky redness, and very painful deglutition, without any great degree of swelling of the mucous membrane of the fauces or of the subjacent parts, signal relief is afforded by deeply scarifying the membrane. The pain on deglutition is often almost instantaneously removed; and the cure is rapid. In all such cases, the scarification should be free. The blood generally flows readily from the divided vessels; retraction of their extremities takes place; and a new recuperative action is substituted for the more sluggish and asthenic that constituted the original affection. Similar good effects supervene on scarification of the tunica conjunctiva in inflammation of that membrane.

Blood is sometimes abstracted from the capillaries of an inflamed part by means of leeches; but it has been made a question with the reflecting, whether leeches are not likely to occasion more mischief than benefit, owing to the irritation excited by their bites, and the afflux of blood to the part caused by their sucking. Apprehensive that such may be the consequence, many therapeutists are in the habit of applying them on the sound parts in the vicinity of the seat of inflammation; but here, again, it may be a question whether there may not be evils attending the practice that are weighty.

When leeches are applied over an inflamed surface, they obtain the blood immediately from the affected capillaries. This, of itself, ought to be salutary. But it is asserted, that their bites become centres of irritation, and that they may augment the phlogosis. This *may* be the case; but in the generality of instances the new action, thus excited, has perhaps an opposite effect;—accompanying, as it does, the evacuation of the dilated capillaries, it may increase their tone; prevent subsequent distention; and thus remove the hyperæmia. When, however, leeches are applied near the inflamed part, they cannot empty the affected capillaries; and by attracting blood into the neighbouring vessels, they may occasion a greater afflux towards those morbidly implicated. The author is not in the habit of applying leeches immediately on the part in external inflammation; but where he has done so, they have not seemed to him to be followed by the aggravation of symptoms anticipated by some; and in many cases marked relief has been experienced. Where applied at all, it appears to him, that they should be placed over the inflamed vessels rather than in the vicinity.

The conflicting views, above mentioned, have been, and are, frequently entertained in cases of mastitis occurring after delivery. Whilst some recommend general blood-letting, and revulsion effected by powerful emetics and cathartics; others advise the application of leeches; and others, again, are of opinion, that their employment is not productive of any advantage. The author has used them in such cases more than once; and it has appeared to him with benefit; but he has seen more from the employment of agents of the excitant kind. The loose texture of the mammæ allows the capillary vessels to be readily over-distended;

an asthenic condition is thus induced in them, which is the source of excitation in the arterial ramifications continuous with the asthenic capillaries, and this asthenic condition is best removed by the application of excitants—as of heat considerably greater than that of the body—to the inflamed part.

Where we are desirous of obtaining a larger quantity of blood than would flow spontaneously from leech-bites, even when encouraged by the application of cloths wrung out of warm water, or by that of a warm cataplasm, cups are sometimes placed over the bites. A considerable quantity of blood may be thus abstracted; and we have the advantage of the revulsion, which the cupping-glass is capable of effecting, should the propriety of such revulsion be indicated.

It has long been the custom at the commencement of the cold stage of intermittents to apply ligatures to the extremities; which, in many cases, have given occasion to a mild hot stage, and abridged the duration of the whole paroxysm. Their *modus operandi* has been a matter of question. By some, it has been supposed, that the obstruction to the venous circulation in the extremities causes an accumulation of blood in the superficial veins; and a consequent increase in the action of the heart. The true explanation is probably the one suggested by Dr. Mackintosh:—the detention of blood in the superficial vessels cuts off, as it were, a certain quantity of fluid from the circulation, so long as the detention continues; and in this manner exerts an analogous effect to the withdrawal of the same quantity of fluid from the vessels. This is illustrated by the following case, cited by Sir George Lefevre from Dr. Wilson, in which the disposition to swooning in an erect attitude appeared to be owing to varicose veins of the lower extremities robbing the brain of its usual quantity of blood. A lady, past the middle age, was so subject to faint when in the erect posture, that, although otherwise in good health, she was confined to her bed and sofa. As soon as she attempted to rise, she felt faint or even swooned. The cause of this phenomenon for a long time baffled the skill of her medical attendant, until, by some accident, he discovered that she had immense varicose veins in both legs; and in the erect posture these became reservoirs for the blood, which accumulated too much in them to be propelled forward; hence, the balance of the circulation was deranged; and the brain, robbed of its usual quantity of blood, manifested symptoms of weakness. By the application of proper bandages, which supported the vessels when she was in the erect posture, the distressing affection was overcome.

HÆMOSTASIS—as this mode of arresting the blood in the vessels has been termed—has been strongly recommended by Dr. Thomas Buckler of Baltimore, as a sedative agent, especially in internal hyperæmia or inflammation; and there can be no doubt that it may be extensively available. “It is capable,” he remarks, “of exerting, under given conditions, a more powerful control over the circulation than the lancet, antimony, or digitalis, and controls the heart’s action without exhausting the vital forces, or giving rise to the ill consequences, which the protracted use of most of the sedative agents is likely to do; and,

finally, hæmostasis in the hands of judicious practitioners must prove the means of saving an incalculable amount of blood ; to say nothing of the incredible benefits, which would be derived from its adoption by those Sangrados of our art, who bleed empirically in all conditions, and who, in many cases, like the fabled vampire, suck the living current until the vital powers are spent."

HÆMOSPASIA, described under REVELLENTS, acts sedatively in a similar manner to hæmostasis.

Under the head of sedatives may be included a set of therapeutical agents, now much used, in Italy more especially ; but also adopted in France and in Great Britain,—rarely in this country,—which, by removing excitation, might be termed *sedatives*, but by their propounders, have been called *contra-stimulants* ; and the theory which suggests them, the *theory of contra-stimulus*,—the *new medical doctrine of Italy*,—*La nuova Dottrina*, &c.

Prior to the termination of the last century, the doctrines of Brown were universally embraced in Italy ; and they continued in vogue until Rasori, on the occasion of a petechial fever making its appearance in Genoa, subjected the prevalent views to considerable modification ; and, as in most similar cases, ended by embracing others diametrically opposite. Rasori maintained, that most diseases are owing either to an augmentation of excitability, or to an excess of stimulus ; and he conceived, that there are certain medicinal agents, which possess a peculiar debilitant power ; and which act upon the excitability of the frame in a manner directly opposed to that in which stimulus acts upon it. To this power he gave the name *contra-stimulus*.

The mode in which the different *contra-stimulants* have acquired their reputation appears to have been as simple as it must frequently have been fallacious. Every agent, which succeeded in removing a sthenic disease, could do so only, it was presumed, by diminishing the excitability, or removing the stimulus : accordingly, it was a *contra-stimulant*. Substances were therefore classed together, which bore no relation to each other—as regarded the physiological phenomena they induced—either in their immediate properties, or in their secondary effects. In the lists are to be found emollients—as milk and gum ; astringents—as acetate of lead ; tonics—as gentian, simarouba, iron, and, according to some, even cinchona ; excitants—as turpentine, squill, and arnica ; emetics—as tartrate of antimony and potassa, and ipecacuanha ; narcotics—as stramonium and belladonna ; acrid poisons—as arsenic, nux vomica, cantharides ; and a host of other animal, vegetable, and mineral substances, which have no kind of analogy to each other. It has been properly observed, that this manner of regarding the effects of medicines tends essentially to bring together the most dissimilar substances, as well as to separate such as are closely allied ; and, consequently, to confound all.

It may be said of this theory, however, as of every other, that the practice built upon it has added valuable facts to therapeutics ; and not the least of these is the knowledge, that tartrate of antimony and

potassa may be administered in large doses, in inflammatory affections, not only with impunity, but with advantage. This potent emetic may be given to the extent of ten or twenty grains or more, in divided doses, during the day, without either producing vomiting or purging; or, if the first doses prove emetic, a tolerance may be soon acquired; and the subsequent doses be followed by no manifest effect, except the diminution of the febrile symptoms. At other times, the urinary and cutaneous depurations appear to be largely augmented, and rapid emaciation succeeds to its administration. The contra-stimulant physicians maintain, that the exaltation of the vital manifestations, in febrile and inflammatory diseases, enables the system to bear the large doses of this and other contra-stimulants; and they say, that the tolerance vanishes with the disorder that communicated it; but this assertion is not confirmed by experience. There is, certainly, a greater resistance to the action of these agents, as there is to blood-letting, when all is exaltation; but the power of resistance does not cease, although it is diminished, when the exaltation ceases. Some individuals, too, never possess the necessary tolerance; so that, with them, tartrate of antimony and potassa does not produce contra-stimulant effects; and it would seem, that there are, also, what the French term "medical constitutions," or "epidemic conditions," which forbid its employment. Thus, according to M. Bricheteau, although it was so successfully used in 1831, it could not be beneficially administered at the end of 1832, and the beginning of 1833. Not until the autumn of the last year could it be resumed advantageously. On one occasion it was given in the hospital by an *Elève de garde*, during the choleric epidemic. The most violent symptoms supervened, and the patient died of cholera morbus, no sign of which existed before the tartrate was taken.

Of the different phlegmasiæ, acute rheumatism and pneumonia are those that are considered to have been most successfully combated by this agent in a large dose. "Emetic tartar," says M. Bricheteau, "should generally be preceded by blood-letting; and commonly it is advisable not to have recourse to the former unless the latter is insufficient, except in cases in which blood-letting is contra-indicated, or impossible, owing to some special circumstances,—as happened to me once in the case of a rickety individual, who had no veins adapted for phlebotomy. The medical constitution of the season, is, also, occasionally opposed to the abstraction of blood: in such cases, tartrate of antimony and potassa is a valuable agent. Recourse may, likewise, be had unhesitatingly to it at the very first, when the patient is exhausted by age or other causes, and appears to be too weak to bear the abstraction of blood; or, where a positive refusal is given to the proposition for phlebotomy." "This agent," he adds, "must also be of great advantage, and of convenient employment, in country situations, where the physician can rarely pay his visits at an early period. It may be practicable, by this method, and with the aid of an intelligent person, to regulate the treatment of a case of pneumonia or of rheumatism for several days after having premised a copious abstraction of blood, if it be considered desirable." The fact, however, referred to by M. Bricheteau—that it is not every one who presents the necessary tolerance—

would render this agent by no means as easy of application by the *laity* as he presumes.

Granting—and it would seem it must be granted—that tartrate of antimony and potassa is a sedative agent, it becomes interesting to inquire into the mode in which such agency is exerted. It is, as is well known, one of our best suppurants; when we are desirous of establishing a centre of fluxion on a part of the cutaneous surface, with the view of removing an internal disease. Experience, too, has sufficiently shown, that, when given in large doses, it produces pustulation in the mouth and fauces, if not lower down the alimentary tube. In a case which occurred under the author's care in the Baltimore Infirmary, this effect of the antimonial was strikingly evidenced. M. Bricheateau—who has administered it largely, as a contra-stimulant—says its local action is exerted more particularly on the mouth, tongue, and pharynx, where false membranes and pustules are occasioned by it; but these lesions, he thinks, are by no means common. The œsophagus, he says, never participates; and they are more frequent in the intestinal canal than in the stomach; and, in the former, the lower part of the small intestines, and the commencement of the large, exhibit themselves more sensible to the action of the antimony than other portions of the tube; but it cannot be said, that sufficient opportunities have occurred for testing the effects of the remedy, and for separating the morbid appearances which have presented themselves, and which may have proceeded from other causes. He is of opinion, that the lesions, which may be referred, with the greatest probability, to the use of tartrate of antimony and potassa,—although he admits they are frequently owing to other inappreciable causes,—are, injection or infiltration of the submucous tissue of the intestines, and softening of the mucous membrane. In the mouth, considerable inflammation—either pustular or ulcerous—is sometimes observed, which speedily disappears after the discontinuance of the antimony.

Many facts and arguments tend to the conclusion, that the contra-stimulant virtues of tartrate of antimony and potassa may be dependent upon its revulsive properties; that this revulsion is produced in the lining membrane of the alimentary canal; and that when it is accomplished, the excited actions, going on elsewhere, become diminished, and more or less nervous and vascular concentration takes place towards the seat of the artificial revulsion, whilst the general effect is one of sedation. Rasori thought, that the remedy lessens stimulation, or augmented excitability, directly: Laënnec first maintained, that it acts as a revellent by irritating the stomach; but the followers of Broussais having made this a ground of opposition to the remedy, he latterly maintained, that it invigorates the activity of the absorbents; whilst Dr. C. J. B. Williams suggests, that the most reasonable view to take of its operation is, that it acts chiefly by diminishing the tonicity of the vascular system. He considers, in other words, that antimony—and some other remedies—“reduce directly the tone of the vascular fibre, acting as relaxants.” “Small doses,” he adds, “certainly relax the pulse and the skin, and when there is no fever produce perspiration without stimulating. They also seem to increase the biliary and intes-

tinal secretion. In inflammation and fever, larger doses are required to produce the same result; and as soon as the excessive arterial tension is relaxed, the chief part of the fever is removed. By thus reducing the increased tonicity of the arteries, the circulation is equalized and quieted, and the determination to and distention of the inflamed part are diminished; and the vessels generally are placed in the condition for their natural offices of secretion, which their extreme tension had before interrupted." "This view," he properly remarks, "is at present no more than hypothetical, and might with advantage be tested by experiments on the lower animals."

SPECIAL SEDATIVES.

1. ACIDUM HYDROCYANICUM.—HYDROCYANIC ACID.

Diluted *Hydrocyanic*, *Prussic*, or *Cyanohydric Acid*, combined with essential oils in certain vegetables, has been long employed as a therapeutical agent; but it was not much recommended in a separate state until about thirty years ago. It exists in the distilled water of *Laurocerasus*, and of bitter almond, as well as in the expressed juice of the leaves of *Laurocerasus*, the peach, &c. Its chief source, however, is in animal matters subjected to heat in contact with alkaline substances.

The Pharmacopœia of the United States, edition 1842, adopts the process of the London Pharmacopœia for the formation of the acid, which consists in separating it by the reaction of *dilute sulphuric acid* on *ferrocyanuret of potassium*. When wanted for immediate use, it is directed to be prepared by the action of *dilute muriatic acid* on *cyanuret of silver*. By the double decomposition that ensues, hydrocyanic acid is formed, which dissolves in the water, and the chloride of silver subsides. The clear liquor is then poured off, and kept for use.

Hydrocyanic acid, thus prepared, is colourless; of a peculiar odour, and wholly volatilisable by heat. One hundred grains produce with solution of nitrate of silver a white precipitate, which, when washed and dried, weighs 10 grains, and is readily dissolved by boiling nitric acid. It contains 2 per cent. of pure anhydrous acid, and has a characteristic odour. This must not be confounded with that of the oil of bitter almonds, which is decidedly different, and is much more dependent upon a true essential oil than on the concomitant hydrocyanic acid. (Christison.) It should be kept in closely stopped bottles, from which the light is excluded. Some have supposed that glass stoppers are absolutely necessary for its preservation; but this has been denied.

Hydrocyanic acid is usually classed amongst narcotic poisons; yet there is reason to believe, that its ordinary effects are purely sedative. Whilst agents belonging to the class of narcotics produce, first of all, excitation in the organic actions, followed, sooner or later, when the agent is in sufficient dose, by signs of sedation; this acid occasions the latter

results only. Of the rapidity of its action, in highly poisonous doses, mention has already been made.

When given in rather too strong a dose, or, if in proper doses, at too short intervals, it produces headache, and vertigo, which go off, however, in a few minutes. With regard to the parts of the economy that are primarily acted upon by it, there can be but little hesitation in designating the nervous system. In no other way can we readily explain the extreme rapidity of its operation in fatal cases; yet when mixed with the blood out of the body, it altogether changes the character of that fluid, and opposes its coagulation.

From what has been said of its action, it is easy to infer the morbid cases in which the acid may be indicated. It is decidedly sedative, allaying nervous irritability and vascular action; and, therefore, adapted for all cases in which these are unusually excited. Yet its power, as a medicinal agent, is not as great as was at one time presumed; and is still presumed by many. The great objections that have been urged against it are,—its dangers, even in a small dose, if not cautiously administered; the difficulty of having it always of the same strength; the impracticability of administering it undiluted; and the danger of giving too strong a dose, in consequence of its rising to the surface of water. More than once, too, the difference in the strength of the acid prepared by different methods would seem to have given rise to unfortunate results. The case of a sick person is mentioned by M. Orfila, who had used it for a length of time, in increasing doses, with advantage; but, being compelled to send her prescription to another apothecary, the acid returned was so strong as to produce death with all the symptoms of poisoning by hydrocyanic acid. For these and other reasons, many of the German physicians prefer *cherry-laurel water* and *water of bitter almonds*, which, although in other respects not less objectionable, are less dangerous. Sir George Lefevre, indeed, affirms, that cherry-laurel water—*Aqua Laurocerasi* is a far more effective preparation than hydrocyanic acid. In many nervous affections, as palpitation, hysteria, &c., he generally prescribes the following draught:

R. Aquæ lauro-cerasi ℥xx.

— flor. aurantii f. ʒj.

Syrup. tolut. f. ʒj. M.

The draught to be taken *pro re natâ*.

The author has frequently employed hydrocyanic acid and its compounds, where a sedative agent has appeared to be needed, but the results have not satisfied him that they were owing to the remedy administered. It has been conceived to be especially appropriate in diseases that depend upon increased irritability of the nervous system, and in those connected with excessive sensibility. In fevers—intermittent or continued—it is rarely used. It is affirmed by Dr. A. T. Thomson, that in no kind of idiopathic fever has it been employed; but in this he is mistaken. There are practitioners, who have prescribed, and continue to prescribe it, in such affections. By many it has been

esteemed beneficial in hectic fever; but here, again, its agency is doubtful. In all the phlegmasiæ, and in every kind of hyperæmia, simple or accompanied with hemorrhage, it has been tried, and numerous testimonials have been offered in its favour. Even in the formidable disease, phthisis, it has been extolled as a moderator of the cough, and a diminisher of the hectic. It is, however, in diseases belonging to the class *spasmi* of Cullen, that its powers are looked upon as most conspicuous,—in diseases, it must be admitted, in which it is difficult to appreciate therapeutical agencies. In asthma, even when the pulse was small, irregular, and often not easily distinguishable, it is said to have acted almost like a charm,—removing the oppressed breathing, and restoring the free play of the respiratory organs; and in whooping cough it has been conceived by Dr. Roe to possess almost a ‘specific’ power. “I do not think,” says another observer, Dr. A. T. Thomson, “I am stretching my praise of it too far, in affirming that few cases of this disease would prove fatal, were the hydrocyanic acid early resorted to, and judiciously administered. After emptying the stomach with an emetic, and purging briskly, the use of the acid should be begun, and the prescription never altered, except to increase the dose of the acid. When thus treated, the disease seldom continues more than a month or five weeks.” “It is necessary,” he adds, “to confine the little patients to a graduated temperature, and to keep them altogether upon a milk and vegetable diet.”

The author has often used hydrocyanic acid in whooping-cough, and endeavoured to observe its effects carefully; but the results have not been such as to enable him to place reliance upon it. It certainly has not answered, in his hands, in the very cases mentioned by Dr. Thomson, half as well as narcotics given so as to produce a sedative influence.

In various neuropathic disorders of the stomach, especially in those in which pain at the epigastrium was the leading symptom; in every form, indeed, of gastrodynia, and in painful affections of the bowels of a similar character, it has been found useful; as well as in chronic vomiting, connected or not with organic disease. It has, likewise, been given in neuralgia with great benefit.

Externally, it has been employed in numerous cases;—as a soothing agent in severe pain,—as in toothache; diluted, as a lotion in painful wounds; as an injection in fistula; and, associated with belladonna, as a cataplasm in neuralgia. In various forms of cutaneous disease, it has allayed irritation; associated with infusion of belladonna, it has been thrown into the vagina in cases of uterine pain from scirrhus; and has been used as an injection in blennorrhœa. It is almost impracticable, however, to enumerate the different morbid conditions in which it has been prescribed. If the practitioner will bear in mind the effects, which it is capable of inducing upon healthy man, when the dose is carried to the requisite extent, he will have no difficulty in deciding upon the cases in which its agency may be appropriate. If not a true sedative, it is the nearest approach to one in the lists of the *materia medica*; and its employment is, therefore, clearly suggested in all diseases in which there is erethism,—administered alone, or along with other agents of the same class.

The dose is one or two drops in a table-spoonful of any simple menstruum, increasing the dose gradually by one drop, until some effect is perceptible, either on the patient or on the disease. The most common on the patient is a peculiar impression in the back of the throat, with sluggishness in the movements of the tongue. "There is no distinct evidence of its being a cumulative poison, though this has been at times suspected. Its operation must be diligently watched at first, till the proper dose be ascertained. This is the only secret for using it with safety and confidence." (Christison.) The ordinary strength of a lotion for cutaneous affections and painful ulcers is one part of the acid to two hundred of water; but the strength may be increased to twice or thrice this amount. Sometimes rectified spirit is added to it. A lotion of f.3i to f.3iv of the acid to a pint of the decoction of common mallow has been used in acne and impetigo to diminish itching; and in ulcerated cancer to allay pain. It is important to bear in mind, that in these cases it affects the system, inducing giddiness and faintness; so that great caution is needed.

2. POTASSII FERROCYANURETUM.—FERROCYANURET OF POTASSIUM.

Ferrocyanuret of potassium, Ferrocyanide of potassium, Prussiate of potassa, Ferroproussiate of potassa, is prepared on the large scale, by calcining animal matters with pearlash in a red hot iron crucible; dissolving the cold calcined mass in water; concentrating, and crystallizing. It may, likewise, be prepared by boiling purified Prussian blue in solution of potassa, till the blue colour disappears; and then crystallizing.

The salt, thus formed, is a double cyanuret of potassium and iron. It is in crystals of a lemon colour, which are wholly soluble in four parts of temperate, and two parts of boiling water; but is insoluble in alcohol. It is in the materia medica list of the Pharmacopœia of the United States.

Ferrocyanuret of potassium is very rarely used in medicine. It would seem, indeed, to be inert or nearly so. Half a pound of a solution of it has been swallowed; and a drachm, and two drachms have been given without any inconvenience. (Christison.) On the other hand, one writer,—Dr. Smart, of Maine,—regards it as a valuable sedative in febrile and inflammatory cases. He ascribes astringent powers to it in the colliquative sweats of phthisis; and affirms that it sometimes induces ptialism, unattended with the fœtor which forms part of mercurial ptialism. He, likewise, found it of service in neuralgia, and in hooping-cough. In an over-dose, it occasioned giddiness, coldness, and numbness, with sense of sinking in the epigastric region. Notwithstanding, however, the recommendation of Dr. Smart, it is scarcely ever prescribed. The author has watched its effects in the sweating of phthisis, but has never witnessed the slightest benefit from it. The dose recommended by Dr. Smart is ten or fifteen grains dissolved in water, repeated every four or six hours.

The salt is chiefly used for the preparation of

3. POTASSII CYANURETUM.—CYANURET OF POTASSIUM.

Cyanuret or *Cyanide of potassium*—received into the edition of the Pharmacopœia of the United States, for 1842, as one of the preparations—is made by exposing *Ferrocyanuret of potassium*—the salt last mentioned—to a moderate heat until it becomes nearly white. It is then exposed to a red heat until gas ceases to be disengaged; distilled water is now added to it when cold, and it is evaporated to dryness. In this process, the cyanuret of iron is decomposed, and that of the potassium remains. It is soiled, however, by the iron, and the charcoal belonging to the cyanuret of iron. When the mass is dissolved in water, the iron and charcoal are deposited; the cyanuret of potassium is dissolved, and is obtained by evaporating to dryness.

The dry salt obtained, must be kept in a closely stopped bottle. It is a white powder, having a sharp, somewhat alkaline and bitter almond taste, and an alkaline reaction. It deliquesces in moist air; is very soluble in water, and sparingly so in alcohol.

Cyanuret of potassium has all the properties of hydrocyanic acid for which it has been recommended as a substitute. Dr. Letheby states, as the result of his experiments on animals, that with the exception of hydrocyanic acid of the strength of four per cent., cyanuret of potassium is the most virulent and active of all the compounds into which cyanogen enters. It has been advised, that it should be dissolved in eight times its weight of distilled water; and to this solution M. Magendie gives the name 'medicinal hydrocyanate of potassa,' and advises, that it should be prescribed under the same circumstances, and in the same doses, as medicinal hydrocyanic acid. He farther suggests, that to render it wholly independent of the action of the small portion of alkali contained in the cyanuret, a few drops of some vegetable acid may be added; or it may be prescribed with an acid syrup. The dose is a quarter of a grain, which may be gradually increased to a grain or more. It has been employed advantageously as an external application in facial, sciatic and other forms of neuralgia; in the form of *lotion*, (*Potass. Cyanur.* gr. i—iv; *Aquæ* f. ℥j;) and of *ointment*, (*Potass. Cyanur.* gr. ij—iv; *Adipis* ℥j.) Added to poultices, it is affirmed to have relieved the pain of white swelling. M. Andral employed it with complete success in a case of intense cephalalgia, which, for ten months, had resisted the most powerful remedies,—as bleeding, a seton in the neck, blisters and sinapisms. It was used in solution in the proportion of six or eight grains to the fluidounce of distilled water; and compresses, wet with it, were applied, for eight days, to the forehead and temple.

Recently, SULPHO-CYANURET OF POTASSIUM, POTASSII SULPHO-CYANURETUM, has been proposed by Sömmering as a substitute for hydrocyanic acid and cyanuret of potassium,—on the ground, that it possesses the same therapeutical virtues without the inconveniences.

4. DIGITALIS.—FOXGLOVE.

The leaves of *Digitalis purpurea*—the pharmacological history of which has been given elsewhere, (Vol. i. p. 286,) are unquestionably referable to the class of acro-narcotic poisons, when administered in a large dose. In ordinary doses, their effect on the circulation is sedative,—diminishing its force and frequency, and acting as a diuretic. In larger doses, it affects the alimentary canal, inducing nausea and vomiting; and also the cerebro-spinal system, causing stupor; and, in very large doses, coma, convulsions, and death. A slow, feeble, and irregular pulse results, with cold sweats. Its operation on the nervous and circulatory organs has been observed by some to be preceded by manifest excitement; by others, however, this has not been witnessed. The author has watched attentively during its administration, but has not been able to satisfy himself of the existence of any precursory excitement. “The publications of Rush, Rasori, and Tommasini,” says a recent writer—Dr. Billing—“would, I think, satisfy any person that digitalis is a sedative, (‘contra-stimulant,’) though, up to this time, not a year passes in which the pages of periodicals are not loaded with attempts to prove it a stimulant.” At times, the pulse is reduced by it as low as 35 beats in the minute. Along with this reduction, when the remedy has been given for some days, there is generally a feeling of great languor, often with anxiety, nausea, vertigo, dimness of vision, headache and delirium; and if the doses be still continued, these symptoms may be followed by those of true poisoning.

Not only are the effects of digitalis induced when the remedy is taken by the mouth, but they equally supervene when it is injected into the rectum or the venous system.

It has often been remarked, that after it has been given in ordinary doses for a time, without producing any constitutional effect, and certainly none of poisoning, it may suddenly explode, as it were, and produce alarming consequences: hence the caution usually inculcated against administering it too vigorously, even when its effects are not apparent. Death, we are told, has resulted in numerous instances from its employment. Yet there are several authenticated instances in which it has been given to a great extent with entire impunity. The author recollects being struck with the freedom with which the tincture was directed by Professor James Hamilton, jun., of the University of Edinburgh, in diseases of women and children that are attended with much vascular excitement; and there are practitioners who give f. $\frac{3}{4}$ ss or f. $\frac{3}{4}$ j with much less effect than might be supposed. Dr. Pereira cites the following communication from an old preceptor of his own, as well as of the author—Dr. Clutterbuck—in illustration of this point. “My first information on this subject was derived from an intelligent pupil, who had been an assistant to Mr. King, a highly respectable practitioner at Saxmundham, in Suffolk, who, on a subsequent occasion, personally confirmed the statement. This gentleman assured me, that he had been for many years in the habit of administering the tincture of digitalis, to the extent of from half an ounce to an ounce at the time, not only with

safety, but with the most decided advantage, as a remedy for acute inflammation,—not, however, to the exclusion of blood-letting, which, on the contrary, he previously uses with considerable freedom. To adults he gives an ounce of the tincture, (seldom less than half an ounce,) and awaits the result of twenty-four hours; when, if he does not find the pulse subdued, or rendered irregular by it, he repeats the dose; and this, he says, seldom fails to lower the pulse in the degree wished for; and when this is the case, the disease rarely fails to give way, provided it has not gone the length of producing disorganization of the part. He has given as much as two drachms to a child of nine months. Sometimes vomiting quickly follows these large doses of the digitalis, but never any dangerous symptom, as far as his observation has gone, which has been very extensive. In less acute cases, he sometimes gives smaller doses, as thirty drops, several times in a day. ‘Such,’ adds Dr. Clutterbuck, ‘is the account I received from Mr. King himself, and which was confirmed by his assistant, who prepared his medicines. I do not see any ground for questioning the faithfulness of the report. I have myself exhibited the tincture to the extent of half an ounce (never more) in not more than two or three instances, (cases of fever and pneumonia). To my surprise there was no striking effect produced by it, but I did not venture to repeat the dose. In numerous instances I have given two drachms, still more frequently one drachm; but not oftener than once in twenty-four hours, and not beyond a second or third time. Two or three exhibitions of this kind I have generally observed to be followed by slowness and irregularity of pulse, when I have immediately desisted.’”

When the effects of digitalis on the circulatory system were first observed, it was fancied that a substitute had been found for the lancet in febrile and inflammatory diseases; and some time even after that period, it was highly extolled as a contra-stimulant by Rasori and his followers. It is rarely, however, employed in simple fever; and neither in it nor in inflammation, can it be substituted for the lancet. It may, however, be used with advantage after blood-letting, and especially when inflammation has gone on for some time, and terminated in serous effusion. As a mere antiphlogistic, it is rarely trusted to in those cases.

The circumstances that guide us in its administration in inflammation apply equally to hemorrhages, in which it is very commonly directed after antiphlogistics; yet but little faith is placed in its remedial agency, in these cases, by Dr. Christison. It certainly ought not to interfere with the employment of other remedies. It has been highly extolled in hæmoptysis; but in no disease is there more difficulty in deciding as to the precise effect of any particular remedy; as the hemorrhage generally ceases, after a time, of itself, and hence so many internal astringents are recommended, which often certainly can have but little influence, the curative effect being mainly, and perhaps altogether, induced by the treatment on general principles pursued along with them.

In diseases of the heart, accompanied by augmented action, digitalis would appear to be indicated, and it is, accordingly, much prescribed in hypertrophy of that organ, both when simple and accompanied by dilatation, as well as in the various affections in which the heart's action

is irregularly exerted,—as in angina pectoris, neuralgia, &c., or where there is an accompanying dropsical effusion, when its diuretic action also becomes serviceable.

At one time, in phthisis, it was considered to be capable of arresting the disease; and, when its constitutional influence is induced, the symptoms often appear to be suspended; but in every case that has fallen under the author's notice, they have subsequently recurred. It has the power of diminishing the velocity of the circulation; but it must be borne in mind, that this velocity is a mere symptom of the pathological condition—the tuberculosis.

In some of the neuroses, it has been prescribed freely, as in mania, epilepsy, and even in delirium tremens; as well as in certain spasmodic diseases, as asthma and whooping-cough; in some of which it has, undoubtedly, been given empirically. It is not easy, for example, to see on what principle it has been prescribed in very large doses in delirium tremens.

After all, the effects which it is known to exert, and which have been described above, will suggest the pathological states in which it is most likely to prove of service.

The ordinary dose of the powder is a grain or a grain and a half, repeated three times a day, gradually increasing the dose—under the precautions already laid down—until some constitutional effect is perceptible. The dose of *INFUSUM DIGITALIS*, (Vol. i. p. 289,) is $f.\overline{3}ss$ to $f.\overline{3}j$; and of *TINCTURA DIGITALIS*, (*Ibid.*) $\mathfrak{m}x$ to $\mathfrak{m}xx$ three times a day. From numerous experiments, Dr. Munk has recently recommended the tincture as acting with the greatest certainty and effect upon the heart.

Digitalis has been applied locally to scrofulous ulcers, and especially to ulcers that are attended with an excess of inflammatory action, in the form of a liniment made with the powdered leaves and honey. In such cases the sedative action of the drug is exerted, and an improvement seems to be effected on the system of nutrition of the part, as manifested by the improvement in the discharge and appearance of the ulcer.

DIGITALIN—the active principle of digitalis—described elsewhere (Vol. i. p. 290,) as having been separated by MM. Homolle and Quevenne, is a most energetic sedative. Those gentlemen found its action on the derma denuded by a blister to be so irritating as to forbid its endermic use. In experiments on their own persons, the action of digitalin on the heart was always manifest, and was commonly exhibited by a progressive diminution in the number of its pulsations, which were lowered in some cases to 40, and generally to 50 or 55 in the minute. Its influence on the circulation appeared to continue for several days after its administration had been discontinued.

It appears to possess all the active properties of digitalis. Its action, however, is most energetic; and, consequently, it requires to be given with the greatest circumspection. MM. Homolle and Quevenne have found, from comparative trials, that four *milligrammes* (gr. .0616) of

digitalin correspond in energy of action to about eight French grains (gr. 6.56) of digitalis;—M. Bouchardat says to gr. 6.176 Troy. It is a hundred-fold stronger than the most active preparation of digitalis. (*New Remedies*, 5th edit. p. 248, Philad. 1846.)

5. COLCHICI RADIX.—COLCHICUM ROOT.

AND

6. COLCHICI SEMEN.—COLCHICUM SEED.

The cormus and seeds of *Colchicum autumnale*, *Meadow Saffron*; SEX. SYST. Hexandria Trigynia; NAT. ORD. Colchicaceæ,—Melanthaceæ; (Lindley,) are official in the Pharmacopœia of the United States. The plant inhabits moist, rich meadows, in many parts of England and in various parts of Europe; and is an autumnal ornament of the gardens,—the flowers appearing in September, and the fruit in the following spring or summer. Various attempts have been made to introduce its culture into this country, with no great success, although small quantities of the bulb raised here, apparently of good quality, are said to have been brought to market. (Wood & Bache.)

Fig. 154.



Colchicum autumnale.

1. Closed Capsule. 2. Open do. 3. Styles.
4. Section of Capsules. 5. Seed.

The bulb is considered to be most active in June or July; at which time it is fully developed, and has not been exhausted by the production of the flower. The seeds must be gathered when ripe. The fresh cormus or root is about the size of a chestnut, and resembles in shape and size that of the tulip; but differs from it in the latter being in scales; whilst that of colchicum is solid. It is convex on one side; and flattened on the other, where the germ of a new cormus is perceptible, which, if it be allowed to grow, shoots into a stem, and bears the flower;—the old cormus, in the mean time, wastes away and becomes inert. This germ, in the opinion of Dr. J. R. Coxe, distinguishes the cormus of colchicum from all others; but it is affirmed that it is not always present. Internally, the cormus is white and fleshy; contains a milky juice; and has an acrid, bitter taste.

To dry the root, it has been recommended, that the dry coats should be removed; that it should be cut transversely in thin slices, and be quickly dried in a dark airy place, at a temperature not exceeding 150° or 170°. These slices—if the drug be in good preservation—are firm; dry; of a grayish white colour, and an amylaceous appearance.

Colchicum seeds are about the size of white mustard seeds; devoid of smell; and of a bitter, acrid taste.

The flowers are not officinal. They are the mildest part of the plant; and have been successfully administered by several English physicians.

Colchicum imparts its virtues to water and to alcohol; but still better to vinegar, and wine, or to diluted spirit of the same strength. Hence, distilled vinegar and wine are used as menstrua for two officinal preparations that are much employed. The cormus has been analyzed by different chemists. At one time, it was believed by MM. Pelletier and Caventou to contain veratria, but from the examination of Messrs. Geiger and Hesse, it appeared, that the active principle was seated in an alkaloid closely analogous to, but not identical with veratria, to which they gave the name *Colchicine* or *Colchicia*. This is found in every part of the plant, crystallizing in slender needles; inodorous; and of a very bitter, and afterwards biting taste. Introduced into the nose, it does not, like veratria, induce sneezing.

In its effects upon the system, it seems to resemble somewhat digitalis;—rendering the pulse less frequent.

In excessive doses, it is a poison of the acro-narcotic class. It is avoided by cattle, and its active poisonous properties have been long known: fatal cases, indeed, occur every now and then from its use, not only in animals, but in man, owing to its too free employment in the treatment of gout. Reynolds—the inventor of the wine of colchicum, commonly called *Reynolds's Specific*—is said to have killed himself by an overdose; and other fatal cases are recorded. It is said to excite occasionally profuse ptyalism.

It appears to be the *hermodactyl* of the ancients, and was extensively employed by them; but had fallen into almost entire neglect, when its use was revived in Great Britain, in the first quarter of the present century, as an efficacious agent in gouty and rheumatic affections; and it is now introduced into almost every pharmacopœia. ✕

In gouty and rheumatic cases, its action has been regarded by some as “specific;” others have ascribed its efficacy in these cases to its action on the kidneys. It is most probable, that its agency is mainly exerted on the nervous system; although it certainly is not easy to explain the precise *modus operandi*. The *Eau médicinale d'Husson* was long a celebrated gout remedy; and was extensively used by men of the first scientific eminence. Many trials were, consequently, made to discover its constituents. These are now considered to be colchicum root, macerated in wine:—the *Vinum colchici*, to be described presently; and it is singular, connected with this discovery made by Mr. Want, that whilst he was directing attention to colchicum, another investigator had satisfied himself that veratrum album was the basis: it has been since shown, that the active principles of the two substances are analogous.

In acute rheumatism, and in various inflammatory diseases, colchicum was proposed and extensively used by the author's valued and able friend, the late Mr. C. T. Haden, of London, as an excellent sedative to reduce excited organic actions, which he thought it was capable of effecting to such an extent that blood-letting might generally be rendered unnecessary in febrile and inflammatory disorders; and the

views of Mr. Haden have been in some degree confirmed by others. The author has often exhibited the different preparations of colchicum in gout; and, frequently, with decided advantage; but very often it has wholly failed. In his own case, it has never exerted any power over the disease. In acute and chronic rheumatism, its advantages have not seemed to him so marked as they have to some. Like other acro-narcotics—*cimicifuga* for example, when carried to the extent of slightly affecting the system, as shown by nausea, with cerebral confusion—it has, at times, effected a revulsion, which has broken the chain in acute rheumatism. In chronic rheumatism, it has exhibited less marked results; yet there is no agent, perhaps, which is so much employed in rheumatic affections. In none of these cases, according to most observers, need any sensible evacuation be produced by it; although some have affirmed—and such certainly is the result of the author's observation—that it is more efficient, when it evinces its influence upon the skin or alimentary canal. Dr. Wigan asserts, that he gives it in rheumatic gout in the dose of eight grains every hour, until “active vomiting, profuse purging, or abundant perspiration takes place, or at least until the stomach can bear no more;” and, when thus administered, he pronounces it to be “the most easily managed, the most universally applicable, the safest, and the most certain specific [?] in the whole compass of our opulent pharmacopœia.”

Colchicum has, likewise, been given in tetanus of warm climates, chronic bronchitis, leucorrhœa, scarlatina, ischuria, prurigo, erysipelas; and it is said to have been prescribed successfully in tape-worm. It is sometimes used externally as a liniment to rheumatic joints, in the form of the tincture of the seeds or bulb.

The dose of the powdered root is from three grains to ten, given several times a day.

Dr. Holland affirms, that he knows no preparation more certain in effect, or better capable of fulfilling the peculiar purposes of the medicine, than the acetous extract.

TINCTURA COLCHICI SEMINIS, TINCTURE OF COLCHICUM SEED. (*Colchic. semin. contus. ʒiv; Alcohol. dilut. Oij*—prepared either by maceration or displacement.) The dose of this preparation is from gtt. x to f.ʒj. Dr. Pereira states, that he has often given f.ʒij at a dose without any violent effect; and Dr. Barlow, who prefers this to the other preparations of colchicum, advises that in gout f.ʒj, f.ʒiss or f.ʒij of the tincture should be given at night, and repeated in the following morning. If this quantity fail to purge briskly, a third dose is administered on the following night.

The tincture is sometimes used externally in gout. For this purpose, it has been recommended to mix two fluidrachms of it with four fluid-ounces of a spirit lotion; but it is affirmed, that the local use of morphia had the same effect,—the part being bathed in hot water for a minute, and then lint applied spread with simple cerate, on which about three grains of acetate of morphia were distributed. More recently, the tincture of the root has been advised as an external application in rheumatism,—alone, or combined with *tinctura camphoræ*. It was much

used at the author's *Clinique* in the Philadelphia Hospital, and often with advantage; but whether much or any benefit was produced by the colchicum, the author was unable to decide.

VINUM COL'CHICI RAD'ICIS, WINE OF COL'CHICUM ROOT. (*Colchic. radic. contus.* ℥j; *Vini Oij*—prepared by maceration or displacement.) This is intended to be a saturated tincture. The dose is from ten minims to a fluidrachm; repeated until some effect is induced.

Sir Everard Home ascribed much of the griping and nausea that sometimes follow the use of this and other tinctures of colchicum, which have not been carefully filtered, to the sediment that forms in them, and which may be removed without injury to the desired effect of the remedy. It would appear, however, that this sediment is inert.

VINUM COL'CHICI SEMINIS, WINE OF COL'CHICUM SEED. (*Colchic. Sem. contus.* ℥iv; *Vini Oij.*) This is in none of the British Pharmacopœias. It is the wine which was so much used by Dr. Williams in gout. The dose is f.℥j to f.℥ij.

ACE'TUM COL'CHICI, VIN'EGAR OF COL'CHICUM. (See Vol. i. p. 290.) This preparation is more frequently given as a diuretic in dropsy; and in gouty and rheumatic cases. The acetic acid unites with the alkaloid and forms *Acetate of colchicia*, which is supposed by some to be equally active with colchicia itself. Sir C. Scudamore, however, combines it with magnesia, in order that an acetate of magnesia may be formed, and the colchicia be left in the most favourable condition for administration. A mixture, proposed by him for gouty cases, which has received the name of *Scudamore's mixture*, is thus made—(*Magnes. sulphat.* ℥j—℥ij; solve in *Aq. menth. crisp.* f.℥x; adde *Acet. colchic.* f.℥j—℥iss; *Syrup. Croci* f.℥j; *Magnes.* ℥viiij.—M. Dose f.℥iss, so that from four to six evacuations may be produced in twenty-four hours.)

7. VERA'TRIA.

Veratria is the active principle of the seeds of *Veratrum Sabadilla*, *V. officinale*, *Helonias officinalis*, and *Asagraea officinalis*, which are known in commerce under the names *Cebadilla*, *Cevadilla*, or *Sabadilla*, and are imported from Vera Cruz and Mexico. They usually occur in commerce mixed with the fruit of the plant; are two or three lines long; of a black colour, and are shining, flat, shrivelled, winged and elastic seeds. *Veratrum Sabadilla* belongs to SEX. SYST. Polygamia Monœcia; NAT. ORD. Colchicaceæ,—Melanthaceæ of Lindley; and *Asagraea officinalis*, to SEX. SYST. Hexandria Trigynia; NAT. ORD. Melanthaceæ.

Although cevadilla is applicable to all the cases in which veratria is used, it is still rarely employed. A *saturated tincture of the seeds* is occasionally prescribed as a rubefacient liniment in chronic rheumatism and paralysis; and is rubbed over the heart in nervous palpitation.

The rationale of the process for obtaining VERA'TRIA, *Ver'atrine*, or

Sabadillin, in the Pharmacopœia of the United States, (1842,) is as follows. Bruised *Cevadilla* is boiled in fresh portions of *alcohol* for three times; the *cevadilla* is then pressed; and the alcoholic solutions, containing *veratria*, united with a vegetable acid, are mixed. The *alcohol* is distilled off; and the residue is boiled three or four times in *water* adulterated with *sulphuric acid*, by which means an impure solution of sulphate of *veratria* is obtained. The liquors are mixed, strained, and evaporated to the consistence of syrup. *Magnesia* is now added in slight excess, which decomposes the salts of *veratria*; and sets the *veratria* at liberty. The dried residuum is digested repeatedly in *alcohol*, which dissolves the *veratria*. The *alcohol* of the different digestions is mixed and distilled off. The residue is boiled in *water* with a little *sulphuric acid* and *animal charcoal*, the second of which unites with the *veratria*, whilst the third removes the colouring matter. The liquor is strained, and the residue thoroughly washed; the washings being mixed with the strained liquor. It is then evaporated to the consistence of syrup, and as much *solution of ammonia* dropped in as may decompose the sulphate of *veratria*, and precipitate the *veratria*. The precipitate is lastly separated, and dried.

Veratria is of a grayish white colour; pulverulent; devoid of odour; and of a bitter acrid taste, producing a feeling of numbness and tingling when applied to the tongue. It is sparingly soluble in *water*, but readily so in *alcohol*, ether, and especially in weak acids, which it neutralizes. On account of its very high price, and the want of well defined external characters, the *veratria* of the shops is said to be very subject to adulteration; and there would not seem to be any good criterion for ascertaining its degree of purity. (Christison.)

Veratria is a most virulent acro-narcotic poison. Minute doses injected into the venous system have induced fatal tetanus. When taken internally in medicinal doses, it causes heat in the mouth, nausea, and feeling of heat in the stomach and bowels,—at times, diarrhœa and headache, with depression of the heart's action. Applied externally, it excites a singular sense of pricking in the part, and occasionally the same cephalic heat and cardiac phenomena as result from its internal administration. Only in a few cases has any eruption followed its application. The endermic use of the remedy has always excited so much irritation as to prevent its repetition.

Owing to its presumed effects on the nervous system, and especially on the spinal marrow and the nerves connected with it, the use of *veratria* was suggested in nervous diseases, particularly in neuralgia, prosopalgia, and ischias. A single friction is said to have been sufficient to remove the disease without relapse. Some advantage has likewise been experienced from its employment in chorea, hypochondriasis hysteria and paralysis, as well as in rheumatism and gout. Dr. Turnbull found it useful in glandular swellings, goître, swellings of the mammary glands unaccompanied by pain, buboes, and scrofulous tumours, even in cases where iodine had failed. Farther experience is, perhaps, needed in regard to its virtues; but the author must confess, that his own observation has by no means confirmed the high-strained eulogies of Dr. Turn-

bull; and this is the general sentiment of the profession. It has often been used externally by the author, as well as by many other American physicians; but has generally disappointed his expectations. Dr. Bardsley thinks it has the properties of colchicum, and may be used with equal advantage in the same cases.

It may be given in pill, or in spirituous solution,—the dose being from one-twelfth to one-sixth of a grain several times a day. A TINCTURE may be made of four grains to the fluidounce of *alcohol*; and of this, ten to twenty drops may be given for a dose in a glass of water. Externally, it is best used in the form of OINTMENT;—(*Veratriæ* gr. v,

Fig. 155.



Veratrum Album. Linn. Var. *Albiflorum*.

x, xx; *Adipis* ℥j.) A piece of the size of a hazel-nut to be carefully rubbed in, morning and evening, or oftener, for from five to fifteen minutes.

SULPHATE OF VERA'TRIA, made by the combination of *veratria* with *sulphuric acid*, has the same virtues as *veratria*. M. Magendie has proposed the following solution as a substitute for *Eau médicinale d'Husson* in gout. (*Veratriæ sulphat.* gr. i; *Aquæ destillat.* f.℥ij. M. Dose f.℥j to f.℥iv.)

8. VERA'TRUM ALBUM.—WHITE HELLEBORE.

White hellebore is the rhizoma of *Veratrum album*; SEX. SYST. Polygamia Monœcia; NAT. ORD. Colchicaceæ,—Melanthaceæ, (Lindley;) a plant which grows in the mountainous regions of Europe, abounding in the Alps and Pyrenees, but is not a native of Britain. The root is brought to this country from Germany in the dried state; and, as met with in the shops, is from two to four inches long, by an inch in diameter, having the shape of a cylinder, or more frequently of a truncated cone. It is rough; rugous; and of a grayish or blackish brown colour externally; internally, whitish; and usually has portions of the root fibres detached from it: at times, the fibres remain attached. These are of a yellowish colour, and of the size of a crow's quill. The odour of the fresh root is disagreeable; that of the dried feeble. The taste is at first bitter, and afterwards acid.

On analysis, white hellebore yields *veratria*, the properties of which have been just considered. Another substance has, likewise, been announced in it, termed *Jervin*,—from *Jerva*, the Spanish name for a poison obtained from the root of white hellebore, the properties of which have not been accurately investigated.

It is a powerful acro-narcotic poison; and an active irritant; hence it is one of the most potent errhines. (See Vol. i. p. 264.) In medicinal doses, unless very cautiously administered, it is apt to induce excessive irritation of the gastro-enteric mucous membrane. It is said,

indeed, to have produced these effects when the rhizoma has been placed in contact with the cutaneous surface; and especially when the cuticle has been removed. It appears to resemble greatly, in its effects, *sabadilla* and *colchicum*.

In consequence of the occasional severity and uncertainty of its operation, it is rarely given internally. Formerly, it was prescribed so as to induce its effects on the stomach and bowels in mania, melancholia, and other diseases of the nervous system, and, doubtless, at times acted beneficially as a revellent; but it is now never prescribed. When great efforts were made to discover the composition of the celebrated gout remedy—*Eau médicinale d'Husson*—it was announced by Mr. Moore, that white hellebore was the chief ingredient; but about the same time Mr. Want established, that a kindred plant—*colchicum*—was entitled to the credit. At that period, it was often prescribed in gout and rheumatism; but, of late, has been almost wholly abandoned in favour of *colchicum*. Its chief use, at the present time, is as an external agent—an antiparasitic—in scabies, and to destroy pediculi. It is also used in *porrigo*, *lepra*, &c. The dose ought not, at first, to exceed one or two grains; but it may be gradually increased.

VINUM VERATRI ALBI, WINE OF WHITE HELLEBORE. (*Veratri albi* contus. ζ iv; *Vini* Oj.) This is the form in which white hellebore has been generally given in gout and rheumatism; but it is not much used. The dose is \mathfrak{m} x two or three times a day,—gradually increasing the quantity, until it exhibits some effect upon the constitution.

9. VERATRUM VIRIDE.—AMERICAN HELLEBORE.

This is the rhizoma of *Veratrum Viride*, *Indian poke*, *poke root*, and *swamp hellebore*, an indigenous plant, which is found in swamps and wet meadows, and on the banks of small streams, in almost all parts of the United States; flowering from May to July. The root is collected in autumn, and ought not to be long kept. Its taste is bitter and acrid; and its properties are probably dependent upon *veratria*.

The medical properties of this rhizoma resemble those of *colchicum* and *veratrum album*. It is acro-narcotic in large doses; and reduces the force and frequency of the circulation in medicinal doses. Professor Tully, of New Haven, who has paid much attention to the virtues of indigenous plants, and especially to those of active powers, recommends it strongly as a substitute for *colchicum*. It has been chiefly given in gouty and rheumatic cases. The author has never prescribed it. It is said to prove emetic in the dose of from four to six grains of the powder; but, as a sedative, the object is to give it short of inducing emesis, and yet to produce nausea or an approximation to it. The proper dose for this purpose will be two grains. It has been prescribed in the form of tincture and extract. Like *veratrum album*, it is used externally as an antiparasitic.

10. CIMICIFUGA.—BLACK SNAKEROOT.

Black snakeroot—the root of *Cimicifuga racemosa*, *C. serpentaria*, *Actæa racemosa*, *Macrotrys racemosa*, *Cohosh*, *Cohort*, *Bugbane*

Fig. 156.

*Cimicifuga racemosa*.

—has been elevated, in the last edition of the Pharmacopœia of the United States, from the secondary to the primary list. The plant is indigenous in the United States; growing in shady and rocky woods from Canada to Florida. It belongs to SEX. SYST. Polyandria Dipentagynia; NAT. ORD. Ranunculaceæ. It yields its virtues to boiling water and to alcohol; and was found by Mr. Tilghman, of Philadelphia, to contain gum, starch, sugar, resin, wax, fatty matter, tannic and gallic acids, a black and green colouring matter, lignin, and salts of potassa, lime, magnesia and iron.

Cimicifuga, in large doses, unquestionably belongs to the division of acro-narcotic poisons; but the author has had difficulty in deciding as to what class of therapeutical agents it ought to be referred. It has appeared to him, however, to exert an action analogous to that of colchicum; and under this impression, he has placed it after that agent.

The testimony of pharmacological writers, in regard to its action, is sufficiently imprecise, and this is shown by the following views of one of the most respectable of them, Dr. Wood, of Philadelphia. “*Cimicifuga* unites, with a tonic power, the property of stimulating the secretions, particularly those of the skin, kidneys, and pulmonary mucous membrane. It is thought, also, by some to have a particular affinity for the uterus, and probably exerts some influence over the nervous system, of a nature not exactly understood. Its common name was probably derived from its supposed power of curing the disease arising from the bite of the rattlesnake. Till recently, it has been employed chiefly in domestic practice, as a remedy in rheumatism, dropsy, hysteria, and

various affections of the lungs, particularly those resembling consumption."

Some years ago, *cimicifuga* was largely employed in the author's wards in the Philadelphia Hospital, by two zealous resident physicians—Drs. E. A. Anderson, of Wilmington, N. C., and Alexander Vedder, of Schenectady, New York—who published cases illustrative of its powers in the treatment of rheumatism, in the 'American Medical Intelligencer,' for January 1, 1838, of which the author was editor; and like other acro-narcotics, when pushed so as to produce catharsis, and even slight narcosis, it certainly appeared to be of service in the acute forms; and these results are confirmed by the recent observations of Dr. N. S. Davis. In its action on that disease it strongly resembled colchicum. It is probably by virtue of similar powers, that it has been found beneficial in chorea. In some successful cases, published by Dr. Kirkbride, of Philadelphia, purging was premised; and general frictions with salt or the flesh brush, and pustulation with croton oil over the spine, are considered by him of much value in the chronic cases. All these agents operate as revellents. The author has prescribed it repeatedly in chorea, but has not had sufficient evidence of its having exerted any beneficial agency. In many of these cases a combined hygienic and therapeutic tonic treatment was subsequently followed by the disappearance of the disease.

A modern writer, Dr. E. J. Wheeler, affirms, that by some eminent physicians it has been thought a good substitute for the ergot in parturition. It is stated, however, by him to be dissimilar in its mode of action, relaxing the parts and thereby rendering labour short and easy; but evidence is required of its possessing any such powers; and still more of its being of any service in incipient phthisis, or in "acute phthisis, uncomplicated with much inflammation in the vesicular structure or pulmonary mucous or serous membranes;" as has been affirmed by a recent writer.

The dose of the powdered root may be half a drachm to a drachm, two or three times a day. It is most commonly, however, prescribed in DECOCTION, (*Cimicifug.* contus. $\mathfrak{z}\text{ij}$; *Aquæ* Oj. To be boiled for a short time. Dose, f. $\mathfrak{z}\text{ij}$ to f. $\mathfrak{z}\text{ij}$ several times a day.) The TINCTURE is also given, (*Cimicifug.* contus. $\mathfrak{z}\text{iv}$; *Alcohol.* Oj. Dose, gtt. xx three or four times a day.)

11. ERGOTA.—ERGOT.

The effects produced by ergot—whose general properties are described under PARTURIFACIENTS, (Vol. i. 425,) when eaten as food, are extremely injurious,—the aggregate of the symptoms having been termed *Ergotism*. At times, these are limited to vertigo, spasms and convulsions, with a peculiar tingling or sense of formication in the arms and legs, which has given the affection, among the Germans, the name *Kriebelkrankheit*, "creeping disease." Most commonly, the limbs waste away, lose sensation and the power of motion; and separate from the body by dry gangrene,—constituting *gangrenous erethism* or *mildew mortification*. Various experiments have been made by feeding ani-

mals on ergot, and, although the results have been discordant, and, in many cases, none have been perceptible, there can be little doubt, that ergot exerts a poisonous influence on many animals, when mixed with their food.

In another place, it is stated, that in his experiments on healthy individuals, Jörg found, that symptoms of acro-narcosis were induced by ergot, when given in large doses; and that he explains the parturifacient effects of the drug by the violence done to the system of the mother. A short time ago, the author caused various experiments to be instituted on healthy persons as to the effects of ergot, in doses of half a drachm, and a scruple, of the powder, and in the form of an oily preparation pointed out by Professor Hooker, of New Haven. These experiments were made on both males and females; and the general effects were those described by Jörg. When the dose was too large, nausea or vomiting often resulted with signs of narcosis. A case of narcosis, produced by the drug, in the dose of thirty grains, administered with the view of restraining a real or supposed tendency to hemorrhage after the expulsion of the placenta, was also communicated to the author by Dr. Beckwith, of Raleigh, North Carolina.

Elsewhere, (Vol. i. 429,) reference has been made to certain experiments by Professor Hooker, of New Haven, who digested ergot in ether, and evaporated the solution, until an oleaginous fluid was left, which consisted of a lighter supernatant oil, and a heavier. The lighter oil was found to be possessed of decidedly narcotic properties; and in certain experiments, made by Dr. McKee, at the author's suggestion, it was found, that in every case, when given in doses of from ten to forty drops, it at first produced slight exhilaration of spirits, with increase of the circulation; but these symptoms were soon followed by sedation, and, in larger doses, by nausea also. It is, perhaps, by reason of those narcotic properties, that ergot has seemed to be serviceable in leucorrhœa, gonorrhœa, dysentery, and other diseases of the mucous membranes, and in various hemorrhages.—epistaxis, hæmoptysis, hæmatemesis, hæmaturia, &c. The author has often administered it in such cases, but has never had reason to believe that it exerted any efficacy; and such has been the case with other observers. It is proper, however, to remark, that Dr. Wright found it, in the form of powder, very serviceable in arresting hemorrhage, and not simply in a mechanical manner as was proved by experiment. Even in the form of infusion, it possessed the power to an extraordinary degree. Dr. Wright affirms, that he has several times divided the external jugular, and the saphena major veins, and has never failed to arrest the flow of blood by an infusion of ergot, although with arteries he was generally less successful. In the greater number of experiments, he used a dilute solution of ergot, in place of warm water, to sponge the bruised parts, and always succeeded in preventing that continued flow, which is often a serious obstacle to the safe direction of the knife. He, consequently, recommends it as a valuable means of preventing troublesome hemorrhage from small vessels in the course of surgical operations; and, upon the same principle, believes the injection of a similar solution into the uterus, in

cases of flooding, will be found to answer every practical end that can be desired.

A few years ago, M. Bonjean highly extolled a watery extract of ergot—to which he gave the name *Ergotine*—as a powerful hæmastatic; and a solution of it was known under the name *Eau hémostatique de Bonjean*. M. Bonjean affirmed, contrary—as has been elsewhere shown—to the opinions of other observers, and to probability, that whilst ergotine contains the medicinal property of ergot, the oil and the resin contain the poisonous properties. He announced it as a real ‘specific’ in hemorrhage in general. It was employed as a styptic in wounds of the capillary and larger vessels; but the same fallacies appear to have existed as in the case of the matico, and the hæmastatic waters already described, (Vol. ii. p. 132); and Drs. J. L. Smith and S. D. Sinkler, of Charleston, inferred from the results of a trial of the so-called ‘ergotin,’ on the divided carotid of a sheep, that it depends greatly, if not altogether, upon the manner in which the lint is applied to the wound of the artery, whether the hemorrhage is arrested or not. If placed immediately upon the orifice of the cut vessel, success is certain; if, however, the vessel shrinks from contact with the lint, the animal is almost certain to bleed to death.

M. Bouchardat, in a recent *Annuaire*, (1848), after having done much, in his former volumes, to disseminate the views of M. Bonjean, remarks;—that “unhappily the facts, which he has adduced as supporting his discovery, are still far from presenting the characters of satisfactory demonstration. As regards the success on animals, it is well known how plastic their tissues are, and with what ease they are repaired after serious injuries; and as respects the effects of ergotin on wounds in individuals of the human species, those that have been published hitherto may be attributed with probability to the circumstances that were associated with the application of the remedy, almost as much as to the action of the remedy itself.”

Ergot is said to have been serviceable in hypertrophy of the uterus, and has been supposed to act as an excitant to the spinal marrow: accordingly, it has been administered in paraplegia, and in retention of urine, and, as has been conceived, with benefit. It has even been given to effect the expulsion of fragments of calculi after the operation of lithotomy! Farther observation is, however, needed before we can regard all these statements to be accurate.

The usual dose of the powder—the form generally chosen in these cases—is ten to fifteen grains three or four times a day.

12. TOBACCO, (Vol. i. p. 135,) and 13, LOBELIA, (Vol. i. p. 133,) are likewise sedatives; but their properties as nauseant sedatives are so fully described under EMETICS, that it is unnecessary to add anything here.

14. ACIDUM HYDROSULPHURICUM.—HYDROSULPHURIC ACID.

Hydrosulphuric Acid, *Sulphohydric Acid*, *Hydrothionic Acid* or *Sulphuretted Hydrogen*, is not officinal in the pharmacopœias of Great

Britain or of this country; but it is admitted into many of those of continental Europe as a sedative agent. It is an important ingredient, also, in sulphureous mineral waters.

This gas is extremely deleterious; killing instantly when breathed pure, and so powerfully penetrant, that it is sufficient to place an animal in a bag of it, without any of the gas entering the mouth, for it to act fatally. Even when mixed with a considerable portion of air, it may prove destructive. Birds perished immediately in air containing one thousandth part of it; a dog died in air containing one hundredth part, and a horse in air containing one hundred and fiftieth part. When breathed in a more diluted state, it produces powerfully sedative effects—the pulse being rendered extremely small and weak, the contractility of the muscular organs greatly enfeebled, with stupor, and more or less suspension of the encephalic functions; and if the person should recover, he regains his strength very tardily. It is the gas which is so dangerous to nightmen, when they descend into the pits of privies.

It has been advised in the way of inhalation, to diminish excitement in pulmonary affections, and especially in phthisis pulmonalis. It has been employed, also, successfully, in a case of obstinate cough that remained after an attack of pneumonia. It may be disengaged by pouring *dilute sulphuric acid* on *sulphuret of potassa* in a cup, and breathing the vapour cautiously through a funnel,—always bearing in mind its extremely deleterious properties. Another form is to dissolve half an ounce of *sulphuret of lime* in a pint of *water*, and to add to this two drachms of weak *chlorohydric* or *muriatic acid*,—the bottle in which the mixture is made being allowed to remain open for a few hours in the patient's chamber.

Liquid hydrosulphuric acid may be made by disengaging sulphuretted hydrogen from a mixture of one of the *sulphurets* with *dilute sulphuric acid*, and causing it to pass into water to saturation. This may be diluted with four times its weight of water. It has been prescribed occasionally as a sedative in pulmonary affections; but is now rarely or never used.

The last edition of the Pharmacopœia of the United States had a formula for LIQUOR AMMO'NIÆ HYDROSULPHA'TIS, *Solution of Hydro-sulphate of Ammonia, Hydrosulphuret of Ammonia*, which was formed by passing *sulphuretted hydrogen* through *solution of ammonia*. It is powerfully sedative, and has been given in diabetes mellitus for the purpose of lessening the morbid appetite, so common in that disease; but it is now scarcely ever prescribed, and has accordingly been omitted in the last edition of the pharmacopœia.

15. SEDATIVE GASES.

Certain of the gases have been used in the way of inhalation as sedative agents, but they are not much employed at the present day. Of the effects of one of them—SULPHURETTED HYDROGEN—mention has just been made.

a. GAS HYDROGEN'IUM.—HY'DROGEN GAS.

This gas is procured by the action of *dilute sulphuric acid* on *iron* or *zinc*; but as a little acid vapour may possibly be diffused through it, it has been esteemed preferable to obtain it, when it is designed to be breathed, by passing water in vapour over iron at the temperature of ignition.

Hydrogen gas appears to act altogether negatively,—proving sedative in consequence of the absence of oxygen, which is the exciting constituent of atmospheric air. It can be breathed with safety when diluted with an equal portion of air; but, for medicinal purposes, is usually mixed with four or five parts. It has been chiefly used in pulmonary catarrh, hæmoptysis and phthisis.

b. GAS HYDROGEN'IUM CARBURE'TUM.—CAR'BURETTED HY'DROGEN GAS.

Carburetted hydrogen, employed in medicine, is made by passing the vapour of water over charcoal at the temperature of ignition in an iron tube. The oxygen of the water unites with one part of the charcoal, forming carbonic acid; and the hydrogen combining with another part of it forms carburetted hydrogen. The carbonic acid is removed by agitating the gas with lime water.

In its undiluted state, it can scarcely be breathed. Sir Humphry Davy found, that at the third respiration total insensibility ensued; and symptoms of great debility continued for a considerable time.

It was, at one time, thought to be a useful sedative in phthisis, and to have arrested the disease in some cases; but the results were by no means uniform: caution, too, was needed in its administration, and—what is applicable to the inhalation of all gases in pulmonary affections—its employment was inconvenient, and often distressing. It has been usually diluted with twenty parts of atmospheric air at first,—the proportion of the gas being slowly increased, and care being taken not to induce much vertigo, or muscular debility.

c. GAS AC'IDUM CARBON'ICUM.—CARBON'IC ACID GAS.

Carbonic acid gas—procured by the action of *dilute sulphuric* or *chlorohydric acid* on *carbonate of lime*; or, what is preferable, by decomposing carbonate of lime by exposing it to a strong heat in an iron bottle, and collecting the gas over water,—when undiluted, is altogether irrespirable, occasioning a spasmodic closure of the glottis and death; but, when diluted with atmospheric air, it appears to possess decidedly sedative properties.

Formerly, it was much employed in phthisis, and great expectations were entertained that it might be at least a valuable palliative in that disease. It seemed, at times, to lessen expectoration, diminish hectic fever, and act as an anodyne. When employed, it was diluted with

four or six parts of atmospheric air. In the irritable state of the bronchial mucous membrane, in which cough and dyspnœa are induced by the application of cold, it has been found of advantage when breathed in a dilute state. The following has been advised as an easy mode of employing it with this view. Put a mixture of *chalk* or *marble* with *dilute sulphuric acid* and *water* into a large glass bottle, so that it shall occupy the depth of only a few inches. Carbonic acid gas is extricated, and forms an atmosphere mixed with atmospheric air in the upper part of the vessel, which may be breathed by introducing a glass tube to about the middle of the bottle, and inhaling from it.

It has been employed externally as a local application to cancerous and painful ulcerations. A stream of it is directed on the part, taking care that the gas is previously transmitted through water, if it has been procured by the action of a mineral acid on carbonate of lime, and confining it for some time over the sore by a funnel connected with the tube.

Yeast Cataplasma—CATAPLAS'MA FERMENTI of the London and Dublin Pharmacopœias—owes its virtues in part to carbonic acid. It is generally, however, esteemed as an excitant; and Dr. Pereira affirms, that he has often heard patients complain of the great pain it occasions. When applied to fetid ulcers, it corrects the fœtor, and promotes the separation of sloughs. It is made of *Flour* ℥j; *Yeast of Beer* Oss; a gentle heat being applied until the mass begins to swell.

Of late years, carbonic acid gas has been sent into the vagina in cases of amenorrhœa, and in uterine pains, which precede and accompany the menstrual discharge; and it is said with success. The fumigations are applied by receiving into the vagina the free extremity of a gum elastic canula, surmounted by a nipple-like end, through which the gas is passed. The gas is disengaged by means of dilute sulphuric or chlorohydric acid poured on carbonate of lime. It does not appear, that any excitant effect is induced by the acid vapour that may pass over with the gas. Still, to avoid all risk, the gas may be first passed through a Woulfe's apparatus, as suggested by an intelligent correspondent of the author, the late Prof. W. R. Fisher.

V. REFRIGERANTS.

SYNON. *Psyclica, Temperants.*

Definition of refrigerants—Modus operandi—External and internal refrigerants—Refrigerant baths—Therapeutical application of refrigerants—In fevers—In the phlegmasiæ &c.—Special refrigerants.

REFRIGERANTS may be defined,—agents that diminish the morbid heat of the body.

The author in another work, (*Human Physiology*, 6th edit., p. 199, Philad. 1846,) has entered at large into the interesting subject of the physiology of calorification, and has there attempted to show, that it is accomplished in every part of the system of nutrition,—not exclusively

in the lungs, as was at one time imagined, and still is by many. But, although not effected exclusively in those organs, the experiments of Le Gallois, as well as those since instituted by others, have led to the inference, that there is always a general ratio between heat and respiration in cold-blooded and warm-blooded animals; and in hibernating animals, in the periods of torpidity and of full vital activity. When the eighth pair of nerves is cut in the young of the mammalia, a considerable diminution is produced in the opening of the glottis, so that, in puppies recently born, or one or two days old, so little air enters the lungs, that when the experiment is made in ordinary circumstances, the animal perishes as quickly as if it was entirely deprived of air. It lives about half an hour. But, if the same operation be performed on puppies of the same age, benumbed with cold, they live a whole day. In the first case,—M. Edwards thinks, and plausibly,—the small quantity of air is inadequate to counteract the effect of the heat; whilst, in the other, it is sufficient to prolong life considerably; and he deduces the following practical inferences, applicable to the adult age, and particularly to man. “A person,”—M. Edwards observes,—“is asphyxied by an excessive quantity of carbonic acid in the air which he breathes; the beating of the pulse is no longer sensible, the respiratory movements are not seen; his temperature is, however, still elevated. How should we act to recall life? Although the action of the respiratory organs is no longer visible, all communication with the air is not cut off. The air is in contact with the skin, upon which it exerts a vivifying influence; it is also in contact with the lungs, in which it is renewed by the agitation which is constantly taking place in the atmosphere, and by the heat of the body, which rarefies it. The heart continues to beat, and maintains a certain degree of circulation, although not perceptible by the pulse. The temperature of the body is too high to allow the feeble respiration to produce upon the system all the effect of which it is susceptible. The temperature must then be reduced; the patient must be withdrawn from the deleterious atmosphere; stripped of his clothes, that the air may have a more extended action upon his skin; exposed to the cold, although it be winter, and cold water thrown upon his face, until the respiratory movements reappear. This is precisely the treatment adopted in practice to revive an individual in a state of asphyxia. If, instead of cold, continued warmth were to be applied, it would be one of the most effectual means of extinguishing life. This consequence, like the former, is confirmed by experience. In sudden faintings, when the pulse is weak or imperceptible, the action of the respiratory organs diminished, and sensation and voluntary motion suspended, persons the most ignorant of medicine are aware, that means of refrigeration must be employed, such as exposure to air, ventilation, and sprinkling with cold water. The efficacy of this plan of treatment is explained on the principle before laid down. Likewise, in violent attacks of asthma, when the extent of respiration is so reduced that the patient experiences suffocation, he courts the cold even in the most severe weather; opens the windows; breathes a frosty air, and finds himself relieved.”

Were the function of calorification wholly accomplished by the lungs,

our refrigerants ought to be applied to these organs to exert their full effect ; but, as the evolution of heat takes place in the system of nutrition of every part of the body, these agents are made to impress only a portion of that system, whence the impression is conveyed to every part, by virtue of the intimate sympathy which is known to exist between them. To the extent of this sympathy, both in its therapeutical and pathological relations, the author has had occasion to allude repeatedly. In the healthy state of the frame, it is evinced by the morbid influence of cold and moisture, when applied even to a small portion of the cutaneous surface, which had been previously shielded from their action. If a healthy person expose his feet to these agencies, the capillary function becomes modified, and there is not a part of the capillary system, which does not feel the effects ; but disease is not induced in the whole, unless the whole is, at the time, predisposed to assume the morbid condition. Generally, there is some portion of the system of nutrition more disposed at the time to take on diseased action than another ; and under the irradiations that occur, owing to the modified organic actions in the feet, disease in such portion results. A similar action takes place, when we apply cold and moisture therapeutically, as is done in febrile affections whenever the skin is steadily hot and dry. We find it is not necessary, that these agents should be applied over the whole of the cutaneous surface, but only over a comparatively small portion,—as of the hands and arms. The sedative influence of the cold is exerted upon the parts with which it is made to come in contact ; the function of calorification has its activity diminished ; and, soon afterwards, we discover that the heat of the whole system has been manifestly lowered by the application.

The temperature of the human body is rarely raised beyond 106° of Fahrenheit's scale. Professor James Gregory, of the University of Edinburgh, was wont to say, that he doubted the accuracy of any thermometer, when a higher temperature was indicated under the tongue or in the axilla. There can be no doubt, that the degree at which Fahrenheit has placed *fever-heat* on his scale, is too elevated. There may be cases in which it has reached that point, but the ordinary temperature of the blood in fever is far below this. In one of the hottest remittent fevers which the author ever attended, it never rose higher than 102° , under the tongue. M. Edwards alludes, in his work on '*Physical Agents*,' to a case of tetanus, communicated to him by M. Prévost, of Geneva, in which the temperature rose to $110^{\circ} 75'$ Fahrenheit.

It was before remarked, that there is a general ratio between heat and respiration ; yet to this there are many exceptions. In the case of a man at St. George's Hospital, London, labouring under a lesion of the cervical vertebræ, Sir B. Brodie observed the temperature to rise to 111° , at a time when the respirations were not more than five or six in a minute ; and other cases of a like kind are on record.

To reduce excessive heat, external agents, of a suitable temperature, are most effectual. Damp cold, of all external means of refrigeration, tends best to diminish the activity with which heat is developed. Hence its value as a refrigerant in fevers,—a point now universally

acknowledged. But if damp cold cannot be sufficiently prolonged, sponging with water of any temperature below that of the body occasions abundant evaporation, and a salutary refrigeration, the effect of which is extended to every part of the frame, in the manner already mentioned.

Cool air is, likewise, a valuable refrigerant; and its admission in febrile affections is generally grateful and salutary. There was a time when it was altogether excluded; when the temperature of the chamber was kept elevated, and hot fluids were administered, with the view of concocting or maturing some fancied peccant humour, and aiding its expulsion from the body. Since the time of Sydenham more especially, these notions have passed away,—although we can yet discover some relics of their existence,—and, fortunately for the patient, the instinctive desire for cold drinks is now no longer opposed. Indeed the use of cold fluids internally, and the free admission of cool air into the apartment, when the weather and the feelings of the patient admit of it, may be looked upon as amongst the most important and salutary elements in our management of febrile cases.

When the ventilation of an apartment is properly attended to, the quantity of febrile heat is diminished,—both by the contact of fresh portions of cool air, and by the increased evaporation that necessarily ensues.

When cold fluids are taken into the stomach, they produce an effect there, analogous to what occurs when they are brought into contact with a portion of the cutaneous surface. They are, indeed, the best internal refrigerants; and, of these, cold water—ice cold—and iced lemonade, are entitled to the preference. Every one must have observed how rapidly and copiously perspiration breaks out over the surface of the body, during the heats of summer, after a glass of cold water has been taken. This must be owing to the refrigerant influence of the low temperature reducing the erethism that exists in the mucous membrane of the stomach, as it does in every part of the dermoid surface, whenever the temperature is extremely elevated. By depressing this erethism to the healthy standard, the sedative influence is propagated at once to every portion of the capillary system; and the cutaneous transpiration is augmented by the diminution of the exalted actions of the cutaneous exhalants. This is the only mode in which the phenomenon can be rationally explained. It is impossible for us to admit, that the fluid can pass so rapidly into the vessels by imbibition as to account for it. The perspiration, in such cases, breaks out almost instantaneously after the fluid has reached the stomach, and impressed the lining membrane.

Writers on *materia medica* have admitted, besides those refrigerants to which allusion has been made, a number of agents, whose operation is much less unequivocal. “There are,” says a modern writer—Dr. Paris—“certain saline substances, which, by undergoing a rapid solution, and acquiring an increased capacity for caloric, produce a diminution of temperature, and if this takes place in the stomach, the sensation of cold, which it produces, is equivalent to a partial abstraction of stimulus; this being extended by sympathy to the heart occasions a transient reduction in the force of the circulation, and by this, or by a

similar sympathetic affection, causes a sensation of cold over the whole body." It is obvious, however, that such substances, according to this theory, can be refrigerant only whilst undergoing rapid solution ; and that, therefore, to produce their full effect, they should be given, either so as to undergo their solution wholly or partly in the stomach, or immediately after they are dissolved. Yet how trivial must be the operation of cold thus produced, compared with that which can be accomplished in fevers by a draught of iced water. And, accordingly, as before remarked, iced drinks may be regarded as amongst the *febrifuga magna*,—the most important refrigerants ; and they are now employed to the exclusion of nitrate of potassa, borate of soda, &c., &c., on which reliance was at one time placed.

There is a circumstance, by the way, connected with the use of these refrigerant salts, which is full of interest to the therapist, and exhibits that wandering from the true track, of which philosophy has to deplore the existence of so many examples in the history of medical science. The author has remarked, that internal refrigerants have been made to comprise—in many definitions—saline substances, which, by undergoing a rapid solution, produce a diminution of temperature in the stomach or elsewhere ; and the definitions have been so worded, and intended, as to include these substances only. Yet, strange to say, the attention of the therapist has strayed from the circumstances, that occasion such substances to be refrigerant ; and we often observe a mixture, containing nitrate of potassa in solution, directed to be administered at intervals throughout the day. In this mode of administration, the whole refrigerant effect, according to the above explanation, must necessarily be lost. The mixture must attain the temperature of the chamber ; and if nitrate of potassa produce any effect, it must be of an excitant character. The practitioner, notwithstanding, places great reliance, perhaps, on his febrifuge mixture ; and this at least is fortunate, for whilst he is administering it, he is not likely to be officiously irritating the intestinal canal by repeated cathartics. In this way, the use of an inert and negative compound may be followed by positive advantage. Dr. Spillan, however, after citing the above observations of the author, adds, that " the refrigerant effects of nitrate of potassa, as a sedative, when given dissolved in even tepid drinks, such as whey, are known to every one." The whole object of the preceding remarks is to show, that they certainly are not known to the author ; yet he has watched most carefully for them : nor have others been more fortunate. Dr. A. T. Thomson states, that " the dose of the salt should not be dissolved until the instant in which it is to be swallowed ;" and Dr. Pereira accords with him ; whilst Dr. Christison, in his ' Dispensatory,' expresses himself in a manner that still more strongly corroborates the views of the author. " Its refrigerant action," he remarks, " generally admitted by systematic writers on materia medica, and by many practitioners, is of doubtful existence,—having probably been inferred rather from the coldness it occasions while dissolving in water, than from actual evidence of its effects in disease. The sedative action ascribed by some to it has been probably inferred from its supposed refrigerant property, and not from observation."

In addition to the internal refrigerants, that come under the definition of Dr. Paris, certain others have been enumerated, which are presumed to exert a temperant effect,—independently of simple abstraction of heat. Thus, *acetic acid*, it is said, when properly diluted, renders the pulse, in a febrile state of the habit, slower; the animal temperature less, and improves the secretions. The same has been observed of all the vegetable acids, as well as of *borate of soda*, and *boracic acid*; but there does not appear to be any strong evidence in favour of their possessing this property. *Acids* and *subacids* are always grateful in febrile affections, and by proving agreeable to the palate they may tend to allay irritation; but this applies equally to *mineral acids*; and, accordingly, *mineral lemonades* are often prescribed beneficially in continental Europe. A modern writer, Dr. A. T. Thomson, excludes them, although he classes among the refrigerants,—*acetic, oxalic, citric, tartaric, and malic acids*.

Of *borate of soda*, and *boracic acid*,—although the latter was at one time termed *sal sedativus Hombergi*,—it is unnecessary to say much. Common consent has led to their total exclusion from the catalogue of internal refrigerants in this country and in Great Britain; although they are still prescribed in some parts of Germany, whose pharmacopœias exhibit too many relics of prejudices, and irrational practices, prevalent in times that have long passed away.

Therapeutical application of Refrigerants.

On the therapeutical application of refrigerants much need not be said. They are obviously proper, whenever the vital manifestations are exalted beyond the healthy standard: yet they may not all be equally appropriate; and the practitioner has to consider, whether other influences may not be exerted by them, independently of mere abstraction of heat;—whether, in other words, their refrigerant operation be simple, or combined with some other, that may modify their influence on the economy. This is well exemplified in the cases of the *cold affusion* and *cold ablution*, when employed at the commencement of

Fevers, with a view of arresting their course. Whilst the former may be successful, the latter may totally fail. The object is, here, to excite a new impression on the totality of the nervous system, as well as to diminish febrile action; and, accordingly, that form of applying the cold medium ought to be selected, which communicates a powerful shock, and thus breaks in upon the morbid chain, which constitutes the disease. As simple sponging of the hands and arms with cold water communicates no such shock, it is manifestly not calculated to cut short fever; whilst, on the other hand, the cold affusion becomes inappropriate whenever the morbid phenomena that constitute continued fever have persisted so long, that all hope of cutting the disease short has vanished; and when any powerful impression is likely to give rise to irregularity of action, and, therefore, to hyperæmia in some internal organ. In these cases it is, that cold, tepid, or even warm ablution is employed so advantageously. It tempers the organic actions of the

part to which it is directed, and thence extends its benign influence to every part of the organism.

A practical rule for the use of external and internal refrigerants in fever is—to observe, whether the skin be steadily hot and dry. If so, cold ablution may be practised; cool air be admitted; the quantity of bed-clothes be diminished, and cold fluids be freely indulged in; but whether all, or any of these, may be applicable to particular cases has to be left altogether to the discrimination of the practitioner.

In the different stages of the paroxysm of an intermittent, conditions are present, that modify materially the employment of agents belonging to the class under consideration. In the cold stage, the hot stage, and the sweating stage, we are guided by rules, which are applicable to similar conditions occurring in other morbid states. In the cold stage, the functions are oppressed and depressed; and there is more or less congestion internally: this is dependent upon modified innervation,—such modification consisting in diminished action: fluids, therefore, which are of a temperature equal to, and above, that of the body, are needed to excite the nervous and vascular systems to a proper play of the functions: as soon as this has been accomplished, and reaction has taken place, general excitement is substituted for the previous state of diminished action, and all the phenomena of synochal or inflammatory fever are present. Cold drinks now become grateful and appropriate; they reduce the exalted organic actions and hasten the supervention of the sweating stage, during which the heat is undergoing resolution, and cold drinks are, consequently, not advisable: tepid drinks are accordingly substituted.

That which applies to cold drinks, during the paroxysm of an intermittent, applies equally to the admission of cool air, and the regulation of the coverings of the patient. In the cold stage, warmth is advisable; in the hot, the whole system of refrigeration has to be adopted; whilst, in the sweating, care must be taken in the application of cold, lest the cutaneous capillaries be morbidly impressed so as to excite irregular action in some important part of the organism, and consequent hyperæmic or other mischief.

Allusion has already been made to the prejudice, at one time universal, against the use of cold drinks in fever. This existed as long as, and even longer than, the doctrine of concoction, which taught, that a certain amount of febrile heat was necessary to mature the peccant matter—the *materies morbi*. Fortunately for the patient, the prejudice is now daily yielding; and we rarely meet with it except amongst those whose minds have not been enlightened by the more modern, and more correct views of therapeutists. The author has likewise referred to a similar prejudice, as regards the use of iced drinks, when calomel has been given. The prejudice is unfortunate, as it often causes the denial of the very best febrifuge we possess; and suggests an opposite plan of treatment, which can scarcely fail to aggravate the disease. Were the idea, indeed, well founded, an interesting and important question would arise, whether the calomel or the iced water should give place? and no doubt, in the author's opinion, ought to exist in the mind of the reflecting practitioner, that it should be the former, in most cases. To

this decision he may be led universally, where calomel is given as a simple cathartic. The lists of the *materia medica* contain such a variety of those agents, that sufficient room is left for selection. Where, also, the mercury is administered as a revellent in fever, or to produce a new action in the system, cold water, in moderation, may be permitted with impunity, and even with advantage. The author has been, for years, in the habit of administering mercurial cathartics, and mercurial revellents in febrile and inflammatory affections, and has never wholly restricted the patient from the use of ice; yet, in no case, has he seen the slightest inconvenience from the association. The notion of detriment from this course is now, indeed, abandoned by the intelligent physician; but it still clings with pertinacity to the extra-professional.

In fevers accompanied with eruptions, the cooling regimen is not less important than in the simple continued, and remittent varieties. There was a time, when the eruption of small pox and of scarlatina was supposed to be injuriously checked by the free admission of cool air; but it is now acknowledged, that the use of refrigerants is attended with better effects than that of any other class of medicinal agents; and, in the generality of cases, the efforts of the judicious physician are confined to the admission of cool air; sponging the body with cold or tepid water—especially during the eruptive fever, and the use of cold water internally; keeping the alimentary canal clear, at the same time, by the employment of gentle cathartics. Allusion has already been made to the peculiar character of scarlatina; and to the fact, that, although the organs concerned in calorification are inordinately excited—yet, it is an excitement originally more nervous than vascular—and, that copious blood-letting, instead of mitigating, often adds to, its violence. In all cases, however—except, perhaps, in the most malignant typhous forms,—the application of cold to the surface, either by means of cold water or cool air, or both, may be had recourse to advantageously. Where such agency is improper, the fact will be indicated by the feelings of the patient. He will be rendered chilly, and the powers of the system will be depressed by it; but there are few cases in which the admission of fresh air will not be grateful and salutary.

Inflammation, and hemorrhage.—It has been conceived that cold sponging, and other forms of external refrigerants are not as serviceable, where hyperæmia exists in an internal organ, as where the case is uncomplicated. This is true; but it by no means follows, that they should do harm. In certain internal inflammations, indeed, we are in the habit of employing them freely as remedial agents, and the author thinks—and it is generally thought—with advantage. In inflammation of the encephalon—primary, or occurring in the course of fever—the practitioner does not hesitate to have the head shaved, and to apply ice freely to it. “In no disease,” says Dr. A. T. Thomson, “does the powerful sedative influence it possesses display itself so conspicuously as in phrenitis. The most furious delirium is quickly subdued by allowing cold water to drop on the vertex, whilst the rest of the scalp is covered with cloths moistened with vinegar and water.” Much, however, of the effect, in this case is revellent rather than refrigerant. The author has before attempted to show, that every form of the cold

douche produces its chief influence by the nervous abstraction it occasions; and not only is this the case in the ordinary hyperæmiæ of inflammation, but in those of an analogous nature, that accompany hemorrhage. The cold key, applied to the nape of the neck in epistaxis, produces its effect in arresting the hemorrhage, less by refrigeration than by revulsion. In active hemorrhage, however, the refrigerant effect of cold is a most valuable agency; and, where ice can be procured, it may be taken internally, without the inconveniences that result from the too free use of cold water. It has been elsewhere remarked, that where hemorrhage takes place, absorption is more active; and, if fluid be largely allowed, it soaks readily through the coats of the blood-vessels, so that in a short space of time there may be the same quantity of blood circulating in the vessels as before the hemorrhagic attack; and as the blood is rendered more watery, a recurrence of the flow follows more easily. But, by taking a small piece of ice into the mouth, the full refrigerant influence is exerted; whilst there is no danger whatever of much imbibition, and consequent repletion of vessels.

The utility of cold applications in hemorrhages was referred to under ASTRINGENTS. Whenever, indeed, it is necessary to produce a diminution in the amount of fluid in the capillary vessels of a part, their employment is indicated; and hence, in topical inflammations, strangulated hernia, &c., they are greatly prescribed. In the first of these affections, they act much in the same manner as hot applications. Both cold and heat, indeed, occasion diminished calibre of the capillary vessels.

Pulmonary diseases.—In diseases of the respiratory organs, which interfere with the due aëration of the blood in the lungs, exposure of the body to cool air—under precautions to be suggested by the individual case—is a useful agent; and its propriety is indicated by the instinctive desire which is felt for the free admission of air under such circumstances. The function of hæmatosis is not confined to the lungs, although chiefly accomplished there. It takes place, but to a slight extent only, over the whole cutaneous surface; and the author has before alluded to the marked connexion, that exists between the functions of calorification and respiration; so that if the latter be impeded, it is requisite that the former should be reduced likewise.

It is unnecessary to dwell on all the cases in which refrigerants may be beneficial. The reflecting practitioner will easily understand those, in which they may be demanded; and, in this, he is fortunately guided, in most instances, by the sensations of the patient. Where the abstraction of heat is attended with disagreeable sensations, it can rarely, or never, be proper: even in fevers, where the employment of refrigerants is most clearly indicated, we are greatly guided by the feelings of the patient; and if the free admission of cool air, cold ablution, and cold drinks excite chilliness, or any uncomfortable feeling, their application has to be regulated accordingly.

SPECIAL REFRIGERANTS.

In the preceding remarks, enough has been said of the acidulous and other refrigerants that are usually employed in febrile and inflammatory affections. It may be proper to add, however, that in these diseases, no single refrigerant is more agreeable than the *soda* or *mineral water* of the shops, kept in ounce vials in ice, and given from time to time when the thirst is urgent. In the absence of this, the artificial *soda powders* may be used; which are made by dissolving in water twenty-five grains of *tartaric acid*, and thirty grains of *bicarbonate of soda*, adding the two together, and drinking the mixture in a state of effervescence:—or, what is better, dissolving each of the powders in half a tumblerful of water, which must be kept cold, and a wine-glassful of each solution be taken whilst effervescing, every two or three hours, or oftener. In this manner, the stomach is not loaded, nor is the tartrate of soda formed in sufficient amount to affect the bowels; for it must be recollected, that in the artificial soda water the patient takes a solution of that salt in place of carbonated water, which constitutes the soda water of the shops.

Effervescing draughts are likewise made with lemon juice. (*Succ. limon.* f.℥ss; *Sodæ carb.* ℥ss; vel *Potassæ carb.* gr. xxv.) The *neutral* or *saline mixture*, hereafter referred to, (p. 212,) is a composition of this kind, given either in effervescence, or after the effervescence has passed away. When it is desirable to unite a refrigerant and cathartic, the *Seidlitz powders*, described elsewhere, (Vol. i. p. 193,) may be given.

1. *Saline Refrigerants.*

Almost all the neutral salts are refrigerant when properly administered; but the saline substances that have been regarded as more decidedly so are the following, which will not, however, require much consideration after the remarks already made in regard to them.

1. POTASSÆ NITRAS.—NITRATE OF POTASSA.

The general characters of this salt have been given under the head of *DIURETICS*, (Vol i. p. 280,) and its title to be esteemed a refrigerant has been canvassed in the general observations on the present class of medicines.

In protracted fevers, it is not unfrequently given in this country, associated with tartrate of antimony and potassa, and mild chloride of mercury; (See Vol. i. p. 312,) but it is obvious that in such a combination it is impracticable to infer anything positive in regard to the action of the nitrate.

The dose, in which it is usually prescribed, is from five to fifteen grains, every three or four hours; and it is well to bear in mind the remark before made, that it ought to be dissolved in water immediately before being taken.

It is sometimes used as a gargle in inflammatory sore throat, (*Potass. nitrat.* ℥iss; *Mellis* ℥iij; *Aquæ* f.℥vj;) and it occasionally forms part of frigidific mixtures, that are applied as topical refrigerants.

Of late, it has been given in large doses in acute rheumatism, as it had been in the last century by Dr. Brocklesby—a distinguished physician of the British army, and medical writer. The testimonies in its favour are not few; but it must be borne in mind, that the disease is self-limited in many instances,—in other words, appears to run a definite course greatly uninfluenced by medicine. From six drachms to two ounces have been given in the twenty-four hours dissolved in sweetened barley water, in the proportion of half an ounce of the nitrate to a pint and a half or two pints of the barley water. It is said, under such circumstances, to act as a sedative, decreasing the force and frequency of the pulse, perhaps indirectly by its revulsive action on the stomach; but farther observations are needed to establish its efficacy, before we attempt to explain the *modus operandi*.

The last Edinburgh Pharmacopœia contained a formula for *Troches of Nitrate of Potassa*, composed of one part of *nitrate* to three parts of *sugar*; which were used in inflammatory sore throat, and in excessive pytalism; but they do not exist in the present pharmacopœia.

The Germans, according to Sir George Lefevre, consider NITRATE OF SODA more antiphlogistic than nitrate of potassa.

2. POTASSÆ CITRAS.—CITRATE OF POTASSA.

Citrate of potassa is never kept in the shops. It is readily made by saturating the potassa of *carbonate of potassa* with *citric acid*; but the salt is deliquescent, and crystallizes with difficulty. A solution of it is very frequently formed extemporaneously; and the Pharmacopœia of the United States of 1842, contains two formulæ for the

LIQUOR POTASSÆ CITRATIS, SOLUTION OF CITRATE OF POTASSA; the one made with fresh lemon-juice, and the other with citric acid. (*Succ. limon. recent. Oss*; *Potassæ carbonat. q. s.*;—or, *Acid. citric. ℥ss*; *Ol. limon. ℥ij*; *Aquæ Oss*; *Potassæ carbonat. q. s.*)

These formulæ are properly, perhaps, introduced, seeing that the mixture is so often prescribed, in order that uniformity may be observed in its preparation. It is the well known '*neutral mixture*,' which, in one form or other, has been employed in febrile cases for ages. When accurately prepared, it is merely a solution of neutral citrate of potassa flavoured with lemon-peel; and has no more diaphoretic virtue than a similar solution of any of the neutral salts. Yet it is constantly administered in febrile cases; and as these generally do well under the observance of a course, which avoids all unnecessary irritation, and removes, as far as possible, disturbing influences when they occur, a portion of the good effects is very apt to be ascribed to any agent which is administered at the same time. The *neutral mixture*, *saline mixture*—as it has been likewise called—has been extensively used by the author; but he has long abandoned its employment, except where it was necessary to carry out a temporizing method of treatment; and in these very cases, it is much preferable to give the mixture in a state of effervescence, in order that the gently excitant influence of the carbonic acid may be exerted on the stomach. Still, for this purpose, the use of the

mineral water or *soda water* of the shops is to be preferred. When kept cold—ice cold—it is an admirable refrigerant, and exceedingly grateful, much more so than the neutral mixture, no matter how well the latter may be prepared.

3. SODÆ BORAS.—BORATE OF SODA.

Borax,—*Biborate*, *Borate*, or *Subborate of Soda*, is probably no more entitled to the reputation of a refrigerant than nitrate of potassa. It is an abundant natural production in Persia, and especially in Thibet, being contained in the waters of various lakes, on the borders of which it is left during the dry season in impure crystals. In this state it is called in commerce *Tincal* or *Crude Borax*, and is usually imported from Calcutta. It is in flattened, six-sided prisms, coloured with a greasy substance which has been considered by M. Vauquelin to be a fatty matter saponified by soda. Different methods have been recommended for purifying it. At one time, the purification of it was altogether in the hands of the Dutch, and was kept a profound secret; but in 1818, MM. Robiquet and Marchand made known the process, which is now generally followed by manufacturers. It consists in rinsing tincal in lime water, so as to decompose the alkaline soap on its surface, and convert it into an insoluble calcareous soap,—dissolving the salt in water, and decomposing any remains of the alkaline soap in the solution by a little muriate of lime,—finally evaporating and crystallizing by very slow cooling. (Christison.) This is *refined borax*.

A great part of the refined borax of commerce is now made by the direct combination of boracic acid with soda. The boracic acid is an abundant natural production of certain lagoons and hot springs in Tuscany; and the mode of separating it is described at length by Dr. Pereira. The manufacture is now so extensive, that one single individual is said to fabricate the enormous quantity of 2,400,000 pounds annually, for the supply of most parts of Europe and America. (Buchner, cited by Christison.)

Borate of soda of the shops is in large crystals, which are oblique rhombic prisms. It occurs, also, in octohedrons, but is generally seen in irregular shaped masses, of a saline, cooling and somewhat alkaline taste. It effloresces slowly in the air, and is wholly soluble in water, the solution having an alkaline reaction. It requires twelve parts of cold water, and two of hot to dissolve it. When added to bitartrate of potassa, it renders the latter soluble—forming *soluble cream of tartar*. This may be effected by boiling six parts of cream of tartar and two of borax in sixteen of water for five minutes.

Borax has generally been considered refrigerant, yet this has been probably owing to the cooling taste of the salt rather than to correct observation of its effects: when used locally, it is admitted to be a mild excitant, causing smarting when applied to sores. It is never given internally in this country as a refrigerant, but is often employed in cases of stomatitis,—particularly of the follicular form; and has been occasionally used as an injection in gonorrhœa and leucorrhœa. In these cases it probably acts as a gentle excitant. As a gargle, it is often used

in association with honey, (*Sodæ borat.* ʒi; *Mellis* ʒiij; *Aquæ* f.ʒvj,) in sore throat, and pytalism.

HONEY OF BORAX, MEL BORA'CIS, is officinal in the British pharmacopœias, (*Sodæ borat.* ʒi; *Mellis* ʒi.) It is used in aphthous affections of children; and, dissolved in water, in stomatitis and cynanche.

BORACIC ACID—formerly termed *Sal Sedativus Hombergi*—is never used, at the present day, as a sedative. It is nearly, if not wholly inert. It has been given in very large doses without producing any sensible effect on the functions.

2. Topical Refrigerants.

In another part of this work, (Vol. i. 505,) as well as elsewhere, (*Human Health*, p. 364,) the author has alluded to the marked difference—and this ought never to be lost sight of—between the effects of a bath some degrees lower than the temperature of the body, and those of one that approaches or exceeds it. Whilst the former is markedly refrigerant, the other is powerfully excitant. The two are adapted, consequently, for very opposite affections.

A difference, again, exists, between *immersion*, *affusion*, and *ablution*,—the former being attended with a shock or powerful impression on the nervous system. When, therefore, the object is to diminish febrile heat,—ablution or sponging a part of the capillary surface, as of the upper or lower extremities, is preferred to general baths, and to affusion,—as the shower-bath, or any variety of the *douche*; but if the object be to excite a revulsive effect,—to break in upon a morbid chain, as to cut short a fever,—then the form of application is chosen which produces the greatest shock, or, in other words, the most powerful impression upon the nervous system. The shower-bath is well adapted for such cases; it acts, in the main, like the ordinary bath, as regards temperature, producing sedative effects, when cold; stimulating when hot. Owing, however, to the shock produced by it, it is not suitable for those of great nervous susceptibility. For such as are predisposed to certain head affections, the shock and refrigeration of the cold shower bath applied directly to the head, whilst derivatives are applied to the lower extremities, often proves most salutary. The effects of the *douche* or *dash* are dependent mainly on the shock; but partly, also, on the temperature of the fluid. They are, however, modified by the size of the stream, and the force with which it is made to impinge on the part. It is a valuable tamer of the furious maniac. The most violent paroxysm can generally be speedily brought to a close by it; and the impression made upon the nervous system is so overwhelming, that tranquillity succeeds rapidly to the state of cerebral excitement and turmoil. It is proper to remark, however, that even the cold affusion is highly recommended by Professor Dickson,—now of New York, formerly of Charleston,—in remittent fever. “The particular indications—he says—which demand the resort to it unhesitatingly, are found in the youth and general vigour of the patient, and the heat

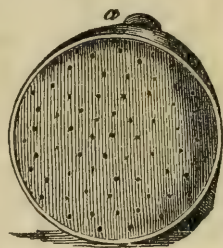
and dryness of the surface. The local determination, which it controls most promptly, is that of the brain, shown by headache, flushed face, red eye, delirium, &c., with a full, hard, bounding pulse. Seat your patient in a convenient receptacle, and pour over his head and naked body, from some elevation, a large stream of cold water; continue this until he is pale or his pulse loses its fullness, or his skin becomes corrugated, and he shivers. On being dried and replaced in bed, a genial sense of comfort and refreshment will attest the benefits derived from the process, which, as I said above, may be repeated whenever the symptoms are renewed, which it is so well adapted to remove." In yellow fever he greatly prefers the cold bath to the lancet. "If I do not deceive myself"—he remarks—"it is equally effectual in subduing morbid excitement, and controlling irritation, without any positive expenditure of, or subtraction from, the vital forces;"—and he adds, that he has never seen any unpleasant consequences from it. The contraindications to its use are great age and debility, and "the rather unfrequent determination to the lungs and bowels shown by dyspnœa and diarrhœa." Should it produce protracted chilliness or other discomfort, he, of course, does not repeat it.

In an ordinary case of hysteria or in cerebral affections for which a small stream of water is sufficient, the *douche* may be formed from the spout of a tea-pot held at such a distance above the head as to regulate the force with which the water is made to impinge upon it.

An excellent shower-bath for children—which may be used also by the adult—has been invented, and is described by Dr. A. T. Thomson. It consists of a hollow vessel made of tin with a perforated bottom, as in Fig. 157.

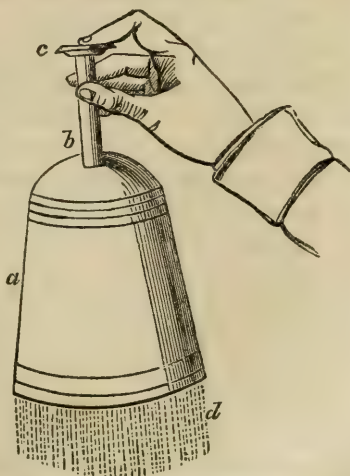
The body of the vessel is of a bell-shape *a*, with a hollow tube *b*, Fig. 158, rising from the top, and terminating in a broad perforated rim *c*. When the bath is to be used, it must be sunk in a bucket of water, until it is completely submersed; the air is thus driven out of the bath, through the tube *b c*, and the bath filled with water. The thumb of an attendant is then to be placed on the opening in the centre of the rim *c*, and the bath is raised from the bucket of water. The pressure of the air on the holes in the bottom retains the water in the bath; and on raising the thumb from the upper orifice, the whole is rapidly discharged. In using it, the child must be placed in an empty tub, and the bath, being held over his head, is then to be discharged. Immediately afterwards he must be dried with friction.

Fig. 157.



Perforated bottom of shower-bath.

Fig. 158.



Shower-bath for children.

Almost the only form of bath now em-

ployed in febrile case is simple ablution, and the warm *pediluvium* or foot-bath. It might seem that, in these very cases, a more powerful refrigerant influence would be exerted by the cold *pediluvium*; and, as regards the mere abstraction of caloric, this would, doubtless, be the case; but the shock or impression made upon the nervous system is so powerful, when we first immerse our feet in a cold fluid, that the cold *pediluvium* becomes liable to the same objections as the cold affusion or the cold *douche*, when employed with simple refrigerant views. On the other hand, the warm *pediluvium* is devoid of those objections; whilst the ultimate refrigerant effects are scarcely perhaps less.

After the remarks already made, it is unnecessary to dwell on the topical use of cold applied to the surface of the body. It is the abstraction of caloric, which is the main agency; and the degree to which this shall be carried must depend upon the particular case. It may be proper to add here, that where the local abstraction of heat is demanded, and ice cannot be had, it becomes important to apply substances—as to the head in cases of encephalitis—which by their evaporation may induce cold: hence, ether and alcohol are employed; and, in ordinary practice, cloths steeped in whisky, which are changed when they become warm. A common mixture for the purpose consists of equal parts of *Whisky*, *Liquor Ammoniae Acetatis*, and *Water*; but it possesses no virtues over simple whisky.

In the application of topical refrigerants, the part should be covered with a single layer of thin linen or cotton or muslin, which should be frequently wetted with the cold fluid; or a sponge, holding it, should be squeezed over the rag, without removing it from the head. Dr. James Arnott has recommended what he esteems to be a perfect mode of applying cold. He covers the part with a very thin bladder of the requisite dimensions, containing a small quantity of water of the desired temperature, which is constantly renewed by establishing a current through the bladder, by means of two pewter tubes,—one connected with a reservoir, and having a stopcock at its end to regulate the stream,—the other leading to a waste vessel. The elevation of the waste-pipe regulates the quantity of water in the bladder; and as, from the change of position of the patient, this elevation must be frequently altered, it is convenient to rest the extremity of the pipe on a sliding ring of a common retort stand. By this apparatus, he says, the temperature can be regulated with the greatest precision, and with such a test as a guide, water can be chosen of the temperature that may be most agreeable to the feelings of the patient. If sudden and severe cold be desirable, very cold water passed rapidly through the bladder will reduce the temperature more speedily than the application of ice. And where great cold is required in the absence of ice, or where the temperature of 32° is not sufficiently depressed, FRIGORIFIC MIXTURES may be substituted, of which the following are amongst the most available:

1. *Ammon. muriat.*; *Potassæ nitrat.* ãã p. v.; *Aquæ* part. xvj. This depresses the temperature from 50° to 10° .

2. *Ammon. muriat.* ; *Potassæ nitrat.* āā p. v. ; *Sodæ sulphat.* p. viij. ; *Aquæ* p. xvj. Depresses from 50° to 4°.
3. *Ammon. nitrat.* ; *Aquæ* āā p. j. Depresses from 50° to 4°.
4. *Ammon. nitrat.* ; *Sodæ carbon.* ; *Aquæ* āā p. j. Depresses from 50° to 7°.
5. *Sodæ sulphat.* p. iij. ; *Acid. nitric. dilut.* p. ij. Depresses from 50° to 3°.
6. *Sodæ phosphat.* p. ix. ; *Acid. nitric. dilut.* p. iv. Depresses from 50° to 12°.
7. *Sodæ sulphat.* p. viij. ; *Acid. chlorohydric.* p. v. Depresses from 50° to 0°.
8. *Sodæ sulphat.* p. v. ; *Acid. sulphur.* ; *Aquæ* āā p. ij. Depresses from 50° to 3°.

VI. REVELLENTS.

SYNON. *Antispastics, Derivatives, Counter-irritants, Revulsives.*

Definition of Revellents—Epispastics—Definition of Epispastics—Rubefacients—Vesicants—Suppurants—Actual and Potential Cauterants—Modus Operandi—Permanent and Intermittent Revulsions—Intensity of the Revulsion—Blisters, as Revellents in Fever—Revulsion in the Changeable Phlegmasiæ—Choice of Situation for the Revulsion—Therapeutical Application of Revellents—In Fevers—In the Phlegmasiæ—In Hemorrhage—In Mental Alienation, Hysteria, Tetanus, &c.—Special Revellents.

REVELLENTS are agents, which, by producing modified action in some organ or texture, derive from the morbid condition of another organ or texture. The effect, thus induced, is termed *revulsion*, *antispasis*, or *derivation*, and it is said, by Conradi, to be exerted, “when a topical congestion, or stimulation, or other affection of a part leaves that part, and is drawn towards another, and usually less important part.”

The author has more than once referred to the value of this agency in the treatment of disease ; and has remarked, that much of the good effects produced by local stimulants, of every kind, is ascribable to this principle of action. The effect, indeed, of almost every variety of revellent, is ascribable to the exaltation of vital manifestation it produces in the parts with which it is made to come in contact. “Next to direct debilitation,” says a modern therapeutical writer—M. Bégin—“there is no medicinal agency more certain, and that ought to be more frequently resorted to, than revulsion. It is induced by stimulating substances, which elevate the organic actions in the parts to which they are applied, or towards which their action is directed, and that are more or less remote from the inflamed organs. The remedies, employed in this medication, have been called, by some, ‘indirect debilitants ;’ but such a denomination is inexact, for all revulsives exert a stimulating impression ; and if their object be to allay irritations existing at a distance, their inopportune use, or their too great activity is followed, in many cases, by contrary results :”—and he adds in a subsequent page—“The

phenomenon of revulsion has hitherto been viewed in too limited a manner. Physicians have not properly attended to the fact, that every medicinal operation by means of which the vital actions are excited in others than the parts affected, also belongs to the class. It would seem, that the rubefacient, suppurative, or escharotic, cutaneous revelleints have alone occupied the attention of practitioners, and that frictions, baths, cataplasms,—in a word, all agents, calculated to solicit organic activity concentrated internally to the external parts of the body, are not esteemed revulsives; and reciprocally, the effects of a multitude of stimulants on the digestive organs, heaped in during the most serious acute diseases, and whose impression is not always mortal, are inexplicable to a great number of physicians, because they do not recognize in them the revulsive effect, which such agents occasionally produce. This medication, when properly investigated, ought to become the object of more extensive and useful considerations in practice, until the whole extent of its influence, and the astonishing variety of which it is susceptible in its applications, shall be better understood.”

Under the history of the separate divisions of remedial agents, already considered, the author has adverted to their revulsive operation; and it has been seen, that all local stimulants are possessed of more or less. It will, therefore, be only necessary, under this head; to make some general observations on their application in disease, and to describe especially those agents that are usually employed as cutaneous revelleints; or, in other words, that are generally classed by therapeutical writers under the head of epispastics and escharotics, whenever the latter are employed to do more than act chemically on the parts with which they come in contact, and to affect organs or tissues, that are at a greater or less distance from the seat of their impression.

EPISPASTICS occasion inflammation, vesication, suppuration, or sloughing when applied to the cutaneous surface. Dr. A. T. Thomson has subdivided them into *rubefacients*, *vesicants*, *suppurants*, and *actual cauterants*. To these, his division of *escharotics* may be appropriately added; for although the articles belonging to this division are generally employed for mere local action on the part with which they are placed in contact, they, like the rest of the class of epispastics, are often used for acting revulsively on other parts of the system.

RUBEFACIENTS, as the name imports, are substances that redden the surface, by exciting the action of the capillaries, and giving occasion to an afflux of vascular and nervous power to the part on which they are applied; hence pain is a usual consequence of their employment. The most common rubefacient, in acute affections more especially, is the sinapism or mustard cataplasm; but every stimulating application,—every liniment, of which capsicum, turpentine, ammonia, &c., form the basis,—is rubefacient. The same may be said of friction with the dry hand, and of the application of heat. Everything, in short, which, by irritating the cutaneous surface, attracts the nervous and vascular influxes to the irritated part, and reddens it, is a rubefacient.

If the rubefacient be sufficiently powerful, it may, besides inducing redness, be followed by an effusion of serum beneath the cuticle, so as to form a blister. The rubefacient then becomes a VESICANT. The first effect of ordinary vesicants is to produce rubefaction; and the action may be arrested at this point, if the practitioner be desirous that it should not extend farther. It may be laid down as a general rule, that blisters do not act by the discharge they excite: their depleting effect, in this way, can obviously be but trifling, unless in very debilitated states of the system,—and in such case, the loss of fluid, thus incurred, might be disadvantageous. Counter-irritation is the great sanative agency; and this can be obtained without vesication, although the production of the latter condition may be an evidence, that the former has been carried to the necessary extent. In the case of many of the vesicants, too, it is difficult to obtain the requisite amount of counter-irritation without vesication resulting at the same time; and therefore the practitioner rarely attempts to arrest their action at simple rubefaction.

Of the various agents, used for exciting vesication, cantharides are the chief; but where it is desired to excite sudden vesication, the application of boiling water, or of the red hot iron, is, at times, had recourse to. Vesication or counter-irritation, thus induced, is rarely, however, as efficacious in changing certain morbid conditions as where it is more general. Hence, time has been regarded, in many cases, as a useful element, in the action of revellents.

The inflammation of the skin, caused by vesicants, is occasionally attended with fatal consequences. It is of the erysipelatous kind, and, under particular circumstances—as regards age, condition of the system, &c.—the inflammation eventuates in gangrene and death. In very young children, great irritation is apt to be induced by blisters, and, if they be labouring under any morbid condition of the dermoid tissues,—such, for example, as is present in measles or scarlatina,—the inflammation may terminate in sloughing or gangrene. To obviate this, when vesicants are esteemed necessary in the diseases of infants, they should not be permitted to remain too long on the part. From two to six hours will generally be sufficient; and a piece of fine gauze or tissue paper may be placed between the plaster and the skin, if cantharides be used, in order that no particle of the flies may adhere to the vesicated surface. An occurrence more disagreeable to the philanthropist can hardly be imagined, than that of a patient dying in consequence of the application of an agent from which he expects a cure, or at least a mitigation of the symptoms; great caution is therefore necessary in the use of these agents in very early life, especially in the diseases referred to. The author has known several cases of death manifestly caused by the use of blisters under such circumstances, although it is probable, that in most of them a fatal event might have ultimately resulted from the disorganization produced by the mischief for which the blister was recommended. Many fatal events have been referred to by Professor J. B. Beck, in his recent "*Essays on Infant Therapeutics*," (New York, 1849). The result has produced, at times, so powerful an im-

pression on the mind of the practitioner as to prevent him from ever afterwards applying blisters in the diseases of childhood.

There is another inconvenience attendant upon the employment of vesicants composed of cantharides,—the absorption of the cantharidin, which enters the circulation, and proceeds to the urinary organs, giving rise to strangury, and, at times, to intense vesical irritation. That this is the mode in which the effect is induced is demonstrated by the fact, that the intervention of tissue paper, or of gauze, although it may not prevent vesication, effectually obviates strangury;—the tissue paper or gauze preventing the absorption of the cantharides. Some have referred the strangury from blisters to sympathy. Were this explanation correct, the tissue paper or gauze ought not to prevent it, as vesication is accomplished through them. At times, it becomes necessary to apply the blistering plaster over a surface, which has been scarified in the the operation of cupping, or over leech-bites. The only precaution, here requisite, is to cover the wounds, made by the scarificator, with tissue paper.

SUPPURANTS produce a deeper degree of inflammation than the epispastics mentioned thus far. Their effect extends to the cellular membrane, involving the whole of the common integuments. Issues and setons belong to this class, as well as the pustulation induced by friction with the ointment of tartrate of antimony and potassa rubbed upon a part—a remedy which has been much employed of late years. It is a somewhat singular circumstance, that when this ointment is rubbed upon the skin, instead of its producing simple inflammation of a diffusive or erysipelatous character, it should excite inflammatory irritation, more especially in the areolar membrane beneath; and that this irritation should exhibit itself in the form of a crop of pustules, not very much unlike those of variola.

In this country, issues and setons are still greatly used, but they are by no means as much so in Europe as they were formerly. They are uncleanly by reason of the discharge they excite, and great attention to them is necessary; whilst it is extremely doubtful, whether any of the benefit derived from them is ascribable to the discharge that accompanies them. On these accounts the author rarely has recourse to them, preferring repeated blisters, and a succession of revulsions, to a more permanent irritation: to this latter the system soon accommodates itself, so that, after an issue or seton has been long established, it becomes, as it were, a part of the healthy condition; and cannot even be healed without danger of evil consequences. At one time, it was the universal belief—much encouraged by the arguments of Mr. Pott—that the discharge is an important adjuvant to the counter-irritation caused by issues or setons; but, since his time, the belief has gradually faded away, and there have been many surgeons—amongst whom may be mentioned Baron Larrey—who think it better to produce counter-irritation, without discharge; hence, when they use moxa, for example, they endeavour to restrict its effects to rubefaction. Still, there are cases—as in spinal disease—where it is easier to insert a seton, or to establish an issue, than to apply a succession of other counter-irritants; and, con-

sequently, issues and setons are no where banished from practice; although they are more sparingly used by the most distinguished practitioners in many countries.

In the *perpetual blister*—as it is called—we have an example of a protracted suppurant agency. An irritating salve is applied to the surface denuded by a blister, which excites suppurative inflammation; and this may be kept up, as in the ordinary issue, of which the perpetual blister is of course a variety,—but it is liable to the same objections as the issue, and may be advantageously replaced by repeated blisters, which establish a succession of centres of fluxion or of revulsion, so that the system never becomes habituated to them; and more influence is, therefore, exerted upon the morbid condition for the removal of which they were employed.

It is to substances, that are capable of producing an eschar or slough, that the term *ESCHAROTICS* has been given. They are, consequently, most commonly had recourse to for the formation of issues, the escharotic being applied to the skin, so as to chemically disorganize it, or destroy its vitality; after which a new action is set up in the vessels beneath the slough, so as to cause it to be thrown off; the excavation is then kept open by inserting some irritant—as an issue pea—which maintains a copious secretion of pus from the ulcerated surface. In the ordinary division of escharotics, as adopted in the books, a separation is made into those which operate more powerfully, destroying the life of the part under all circumstances, and which are arranged under the head of *cauterants*; and those that act with less energy, and are chiefly employed to destroy diseased and fungous growths, and which are classed as *erodents*.

Cauterants may be either *actual or potential*; that is, they may either produce their effect by the agency of caloric, or by virtue of chemical powers, which are capable of destroying, or disorganizing, the living solid. The effect of the actual cauterant differs according to the form in which the caloric is applied—for example, by means of heated metal, or the moxa, or by heated vapour, water, or other fluid. It differs, also, when the metal is used, according to the degree of heat:—at the white heat producing immediate disorganization of the parts with which it comes in contact; and at the red heat, a state which may admit of the parts being restored, without much, if any loss of substance. The less degree of heat is, therefore, attended with more pain and inflammation; because the vitality of the part is not extinguished.

Whenever actual cauterants are employed as counter-irritants, the excitement they occasion is rapidly effected;—at once, by the application of heated metal or water,—more gradually, by the moxa; but still, even in the latter case, almost instantaneously, compared with the action of many of the class of potential cauterants, which require a long time before the eschar is formed. This is the case with caustic potassa,—the potential cauterant most frequently employed. It is not until after the lapse of several days, that the eschar made by rubbing potassa over the skin separates, or gives unequivocal evidence of disorganization. As the effects of actual cauterants are rapid and severe,—

accompanied with intense pain, heat and redness,—they are adapted for cases, in which it is necessary to make, at once, a powerful impression upon the nervous system. Accordingly, the use of moxa has occasioned a salutary abstraction of the nervous influence; and many deep-seated pains have yielded to it, which had resisted the action of the ordinary counter-irritants, although repeatedly applied. In long continued neuralgic pains, whether seated in the cerebro-spinal centres, or in the nerves emanating from them, the morbid catenation is often suddenly and effectually broken in upon by severe and rapid revulsions.

Of the value of moxa, as a therapeutical agent, in these and similar cases, numerous examples are recorded on the authority of Baron Larrey, and of many other practitioners of France and the continent of Europe more especially. The remedy was introduced to the notice of British practitioners by the author, in the first English monograph on the subject; and, since then, it has been treated by Messrs. Wallace, Boyle, and others. (*“On the use of the moxa as a therapeutical agent; from the French of Baron Larrey, with notes, and an introduction, containing the history of the substance,”* by Robley Dunglison, etc., etc. London, 1822.)

All the forms, then, of epispastics are indebted, for their efficacy as remedial agents, mainly to the counter-irritation or revulsion which they effect; and the choice of such as are adapted to particular circumstances of disease must greatly depend upon convenience, &c., of application, which certain articles of the class may possess more than others; and as there are generally fewer objections to vesicants and rubefacients than to the others, they are more frequently employed, whenever the revulsion, which epispastics in general are capable of effecting, is deemed necessary or expedient.

In the employment of revulsives in general, it is an interesting inquiry to determine the extent of surface, which it is desirable to affect by their direct application. This is a difficult matter to decide. It is obvious, however, that if we have the vital manifestations modified over a very limited compass, but little beneficial agency may be exerted on the morbid catenation, which it is designed to break up: whilst, on the other hand, if a large surface be irritated, the disease may be aggravated by the irritative irradiations proceeding from it. Moreover, it is probable, that if an extensive surface were inflamed in this manner, the same disastrous consequences might ensue as in cases of extensive burns. In these, it has been considered, that death will almost surely occur, if they implicate one-eighth part of the cutaneous surface. M. Bégin affirms, that the extent of the surfaces, receiving the impression destined to become revulsive, exerts great influence. Thus, the same pediluvium, which proves inefficacious when applied to the feet, may often produce the desired effect if the whole leg be immersed; and he adds, that an extensive though moderate rubefaction may produce greater effects than a violent inflammation limited to a small portion of integuments. This is true, however, only within cer-

tain limits. In many affections, as the author has remarked in reference to moxa especially, a violent degree of irritation, excited over a very trifling extent of surface, may affect what other varieties of epispastics, although repeatedly employed, have totally failed to accomplish. Custom has established a magnitude for the ordinary blister, as well as for the extent of surface to be implicated in the formation of an issue; and although it is possible and probable, that the size might often be varied with advantage, it is a point, as already observed, on which it is extremely difficult to decide.

A similar remark applies to the length of time, during which counter-irritation should be maintained, in order to produce the greatest amount of benefit:—whether, for example, a mere momentary irritation, however violent, can occasion as salutary results as one that is more prolonged; and again, whether a permanent or an intermittent revulsion is, as a general rule, more effective for the removal of disease, especially of disease of any continuance. In the case of moxa, the revulsion is temporary; yet, we have seen, it has been often useful. The revulsion from moxa is not, however, in general, as well adapted for the removal of inflammatory and many other morbid conditions, as that which can be effected by vesicants, and by certain of the rubefacients. It is chiefly when the diseased action has been prolonged for a considerable period, and in affections, which belong to the neuralgic class, that sudden and violent revulsions are productive of the most marked advantage. When diseases are of an acute character—as the different phlegmasiæ—revellents, which implicate a greater extent of surface, and are more prolonged in their action, are decidedly preferable.

In answering the question, whether a permanent or an intermittent revulsion be more efficacious?—the author does not think, that much difference now exists amongst therapeutists. The majority are unequivocally in favour of the latter plan, although circumstances may often induce them, in practice, to have recourse to the former. The reasons, in favour of this preference, are cogent. When an artificial irritation, accompanied or not by increased secretion from the part, has been established for a time, it ceases, in a great measure, to be a morbid condition, and becomes, as it were, a part of the healthy function; so that it cannot be arrested without inconvenience being apt to result, and without danger of a centre of fluxion being established in some internal organ, that may at the time be more disposed than others to assume the morbid condition. In this way, many discharges, the result of morbid action, may become, at length healthy; and cannot be officiously interfered with. On the other hand, if a succession of irritations be produced, the system never becomes habituated to them; and the repetition of the irritation, after the lapse of a short period, occasions the same beneficial impression, as on its first employment. Hence it is, that a succession of vesicants, and, indeed, of every variety of epispastic, is to be preferred to a more permanent application; and that issues and setons lose much of their beneficial influence in the latter periods of their employment, their good effects, as revellents, being in an inverse ratio with the shortness of the period, during which they have been in action.

The intensity of the artificial irritation induced by a revellent is worthy of consideration in a therapeutical point of view. If it be but trifling, it may be insufficient to break in upon the internal morbid catenation; and, on the other hand, if too violent, irritative irradiations may proceed in various directions, and even add to the internal mischief. Every practitioner must have occasionally witnessed an aggravation of symptoms from this cause, especially in those whose nerves are unusually impressible. In such, no variety of epispastic can, at times, be used. There are some who are thrown into the most violent nervous agitation by the application of the smallest blister; and blisters have occasionally been known to induce convulsions. Certain individuals, too, suffer excessively from the vesication caused by cantharides, and, yet, they may not be—what would be called—extremely nervous. Their cutaneous nerves are, however, unusually impressible. In such persons, vesicants would necessarily fail in their effects, owing to the general disorder which would follow the high degree of erethism of the dermoid structure. In such individuals, blisters are never found to exert their ordinary salutiferous agency; on the contrary, the irritation they produce is reflected to every part of the economy, and too often the diseased action, for the removal of which they were applied, is, in this way, augmented. In like manner, where the powers of the system have been greatly reduced, and much nervous irritability has been developed, blisters are apt to cause mischief. M. Broussais has made this fact the foundation of one of his propositions,—restricting it, however, to cases of gastro-enteritis.

The character and period of the disease have much to do with the action of revellents. Every practitioner must have observed, that in phlegmasiæ, when the disordered actions run high, but little effect is usually produced by them. The author had an opportunity of witnessing, for a long time, the practice of an individual, much engaged with the duties of his profession, who always had recourse to blisters, from the first onset of inflammatory affections, and often not only with impunity but with advantage. Such is the practice pursued by M. Gendrin of Paris,—the greater part of his treatment in pneumonia and other acute inflammations consisting in the application of very large blisters; and it is affirmed by two followers of his service at La Pitié, that their repeated application, with a very moderate use of blood-letting, was attended with very successful results. It is an interesting question, however, to solve,—whether the inflammation induced by large and repeated blisters may not augment the ratio of the fibrinous element of the blood. Experiment can alone determine this. “A large blister,” says M. Andral, “takes from the blood a certain quantity of its serum; but some fibrin is deposited at the same time at the surface of the sore caused by the action of the cantharides. Where there exists in the blood a superabundant proportion of fibrin, would this be the means of diminishing the excess of that principle in the blood? Or rather, if the action of the cantharides be exerted over a pretty large surface, or the inflammation resulting from it be intense,—if, especially, it augment the febrile movement already existing, may there not thus arise a new cause for a superabundant formation of fibrin; and may not this cutaneous

phlegmasia, artificially induced to diminish the intensity of another phlegmasia, by the kind of influence which it may exercise upon the blood, have the effect of augmenting the morbid condition, which represents in the blood the inflammatory state, and marks the intensity of it?"

Theoretically, it would seem, that if the organic actions are already largely exalted, any source of irritation ought to add to such exaltation; the principle, however, that two irritations do not easily exist, at the same time, in the body, in the like intensity, applies even here; and the author can say, from extensive observation, that although the beneficial agency of revellents is not as marked as where remedies have been premised to allay in some measure the tumult, they have not always appeared to him to aggravate the disease; and have often been followed by a mitigation of the morbid action. He cannot, therefore, subscribe to the opinion of M. Bégin, that "in very strong subjects affected with intense irritations accompanied with considerable febrile excitement, and having their seat in viscera important to life, or propagated to larger surfaces, revulsion is next to impossible, and cannot even be attempted without danger." The danger does not appear to the author to rest so much on the employment of revellents, as on the neglect of more effective measures, which such cases imperiously demand.

It has been maintained by M. Broussais, that revulsive irritations must always be stronger than those they are intended to replace, otherwise they turn to the benefit of the latter; but this appears to be a mere *gratis dictum*; and it has, accordingly, been dissented from by many of his followers. Upon the principle of action, which the author has endeavoured to lay down, it would seem, that good must always be derived from a revulsive irritation in appropriate cases, even should such irritation fall somewhat short of the precise degree necessary for completely putting an end to the morbid action for the removal of which it was adopted. He cannot see how the morbid action must necessarily be augmented by it.

There was a time, when blisters were much employed at a particular period of adynamic fever—in the very cases, indeed, in which, according to M. Broussais, they do not render the services expected of them. The practice has gone out of vogue in Europe, but it is still followed in this country. It consists in applying blisters to the arms and legs in protracted fever, when the powers of life have become so far reduced, that stimulants appear to be clearly indicated. It has been before remarked, that epispastics are not advisable stimulants in fever; but, as revellents, they may be had recourse to, occasionally, with advantage. When, for example, the disordered actions, constituting fever, have gone on for weeks, without the existence of any considerable local mischief, the revulsive irritation, induced by epispastics, becomes a centre of fluxion, so that the mischief is, as it were, localized; and the morbid chain broken in upon. Accordingly, in this way, epispastics may be used advantageously in febrile complaints; but care must be taken, that the irritation induced by them is not too intense, so as to be reflected to every part of the system, and thus add to, rather than detract from, the disorder of functions. In like manner, in chronic irritations of

different organs and tissues, epispastics frequently break in upon the habitual derangement of action, and succeed in inducing a salutary revulsion, after every other medication has failed.

It would be a matter of moment were we enabled to point out the parts of the system, which sympathize with each other, in such sort, that if revellents were applied to the one, they might certainly detract from the morbid actions going on in the other; but this is a difficult subject of investigation, and we are not sufficiently masters of the physiology of the animal economy to pronounce with much satisfaction upon it. Often, too, we find, that although sympathetic movements may be established between different organs, they are by no means of the antithetic or revulsive kind; and hence the rule—difficult of execution—has been laid down, that artificial irritants should be made to operate upon such parts as perform functions contrary to those of the irritated organ; and always at a distance from those that may sympathize with that organ. In elucidation of this, it has been remarked, that the skin may be irritated with advantage in pulmonary catarrhs, owing to the balance of action existing between it and the mucous coat of the bronchia, but this does not apply to gastritis, as its over-excitations are too readily communicated to the stomach. These rules are, however, too exclusive; and every therapist must have discovered their inaccuracy in the good effects which he has found to be produced by revellents, where the lining membrane of the stomach has been more or less inflamed. The severe vomiting, which accompanies such affections, often resists every other remedy, and is ultimately arrested by epispastics.

The true explanation of the action of revellents appears to be the one already offered,—that two irritations do not readily exist, at the same time, in the system; so that, if, under proper conditions, during the existence of any morbid irritation in an internal organ, an artificial irritation be excited at a due distance from it, the morbid process may subside in the internal organ, and the vital energies be concentrated towards the part artificially irritated. Farther than this we cannot go with much satisfaction; and if we attempt to designate the parts, which perform functions that are antagonistic to those of the irritated organ, in order that we may apply our revellents to them, we may be led to erroneous conclusions. On the deeply interesting subject of the sympathies of organs, we are but little instructed. We observe the physiological relations between the stomach and uterus, in the changes induced by pregnancy; and the intimate consent between the latter organ and the mammæ, as evinced in the same changes, as well as in the evolution of organs that takes place at puberty; but who could have divined the sympathy between those organs, referred to by a modern observer, Dr. Rigby, from which, it would seem, practical advantage may be derived in the suppression of uterine hemorrhage. Allusion is made to the sudden and powerful contraction, which is excited in the uterus, when in a state of inertia, by applying the child to the breast. A common saying, amongst nurses—that “the child brings after pains”—shows, that this sympathy has been a matter of observation amongst the vulgar; but Dr. Rigby’s attention was first directed to it by Carus, who in his “*Gynäkologie*” recommends the application of the child to the breast, to

promote the expulsion of the placenta. "In cases," he remarks, "where there has been considerable disposition to hemorrhage after labour, from non-contracted uterus, and where I have been afraid to leave the patient, lest flooding should come on in my absence, I have been for the last two years in the habit of ordering the child to be put to the breast, as soon as the clothes, &c., were changed, and herself comfortably settled in bed, feeling that I thus diminished the chances there might be of any hemorrhage occurring. It was not, however, till last year that I began to see the practical importance of this sympathetic connexion between the breast and uterus in its full extent. Having had two or three cases of severe hemorrhage after labour, from uterine inertia, which had to a degree resisted all the common modes of treatment, and where permanent contraction could not be induced even by repeated injections of cold water and vinegar into the vagina, I determined to see what effect the application of the child to the breast would have upon the relaxed uterus, and was agreeably surprised to find the observation of Professor Carus confirmed in its fullest extent,—firm and permanent contraction having been immediately produced in every case."

Admitting, then, that such a sympathy exists, how important, in a therapeutical point of view, to be acquainted with it! It is not, however, always easy to apply the child successfully to the breast soon after delivery. The young being is awkward; and cannot seize hold of the nipple. In such case, the application of the breast-pump would probably be an efficacious substitute. It is certainly worthy of trial; and may be found useful in hemorrhage, which is dependent upon a want of due contraction of the uterus. The importance of discovering the precise play of sympathies between different organs is strikingly exemplified by this case; and observation may, hereafter, point out many others, which may aid us materially, in the therapeutical application of our remedial agents. At present, we are greatly in the dark, and most of the suggestions on the subject have been hazarded rather from particular theoretical considerations than from observation.

In diseases that are metastatic,—constituting, what have been termed, by some, the 'changeable phlegmasiæ,'—we might seem to have an index to the proper organ on which to apply our revellents. In parotitis, or 'mumps,' after the inflammation has existed for some time in the parotid gland, it is apt to quit its seat, and pass to the testicle of the corresponding side in the male, and to the mamma in the female. In the same way, rheumatism or gout appears to leave the joints; and attach itself to some internal structure. In all these diseases, there is a tendency, in particular structures, to be morbidly implicated; and they, who believe in metastasis, consider that there is a true translation of the disease from one part to the other, or at least a decided predominance of irritation in the organ sympathetically irritated. "Organs," says M. Broussais, "sympathetically irritated, may contract a degree of irritation greater than that of the organ from which they derive their irritation: in these cases, the disease changes its seat and name; these are metastases." Others consider that metastasis is a mere extension of the disease to structures liable to be affected by it;—such extension occasioning a diminution of diseased action in the part primarily

affected. For example, the tissue composing the heart and the parts about the joints is liable to be attacked by rheumatic inflammation; and, when the inflammation has been seated in the joints for a time, and symptoms of pericarditis or endocarditis supervene, it is conceived, by one party, to be owing to the retrocession of the articular inflammation, or to metastasis; whilst the other maintains, that the affection of the heart is simply owing to an extension of the articular inflammation, which is more or less diminished in the part first attacked, owing to its diffusion over a larger extent of surface.

But, in whatever light it may be regarded, whenever an affection, esteemed metastatic, has diminished in, or left, a part, and become prominent in a more important organ, the indication to be fulfilled is, in the minds of most practitioners, to call back the irritation to the part primarily affected, by the application of revellents;—to the parotid region, for instance, where the testicle or mamma has become inflamed in parotitis; and to the joints, in cases of gouty or rheumatic inflammation translated or extended to internal organs. The remedy, however, is not as clearly indicated as might at first appear. The organs concerned seem to possess this sympathy only under special morbid conditions; between which, and the irritation excited by revellents, there may not be the slightest similitude; and this accounts for our want of success, when we attempt to recall a changeable phlegmasia back to its former seat. In accordance with the views generally inculcated, the author has, over and over again, attempted, by revellents, to bring back inflammation to the parotid in cases of retrocedent parotitis, and to the joints, in cases of gout and rheumatism; but he does not recollect, either in his own practice, or in what he has witnessed in that of others—in public or in private—a solitary instance where such an appeal has been responded to; and, accordingly, he now attends exclusively to the superinduced affection, and never, for a moment, suffers his attention to be diverted from it; for, in the cases of pericarditis especially, which are so often observed as concomitants of acute rheumatism, any loss of time might be fatal. It is indeed, by no means clear, that the artificial irritation, which we excite by revellents, can be practised, in such cases, with perfect impunity. We must bear in mind, that the inflammation, which has changed its seat, was originally situate in the part we desire to irritate artificially; and it might be asked, with much propriety, whether the revulsive irritation we induce may not equally pass to the organ secondarily implicated, and add to the mischief already existing; so that, in truth, revellents may be less safe and efficacious there than when applied to other parts of the economy.

Contrariety of sentiment exists among therapeutists as to the part to which epispastics ought to be applied; some maintaining, that they should be as near as possible to the seat of the disease; others, at a distance from it. A good deal of this discrepancy has been owing to the varying views entertained of the precise *modus operandi* of epispastics,—and especially of vesicants. By some, who believe that inflammation is dependent upon debility of the extreme vessels, and that this is always the prominent lesion; the epispastic is applied as near as possible to the seat of the disease, with the view of stimulating the

debilitated vessels to a more healthy condition. The same practice, although on less intelligible grounds, has resulted from the revulsive theory; the idea being, that the nearer the artificial irritation is to the seat of the disease, the more powerful and satisfactory will be the revulsion. This is the view entertained by most modern writers on therapeutics; but it seems to be neither consistent with theory, nor with observation of facts. The recommendation, indeed, appears to have been handed down from one writer to another, without sufficient reflection; and hence we discover no clear ideas either as regards the mode of action of revellents, or their therapeutical application. Whilst Dr. A. T. Thomson affirms—without offering any reason for the affirmation—that “blisters, by whatever means they are raised, should be applied, as near as possible, to the affected part;” he observes, elsewhere, when treating of the employment of epispastics in apoplexy, that “in applying blisters, or employing other epispastics with this view, I found them *more beneficial when applied to the nape of the neck than upon the head.*”

Similar diversity is perceptible in the observations of Dr. Chapman of Philadelphia on this subject. “It will be right,” he says, “in local affections, and in the whole of the phlegmasiæ, to apply the blister as nearly as possible over the immediate seat of the complaint, its efficacy thereby being much increased: but wishing to interrupt trains of morbid association, as in most of the diseases of periodical recurrence, to the extremities alternately will answer better. *Equally does this precept apply in the cases where revulsion is the object.*” Since this paragraph, however, was written, Dr. Chapman’s views regarding the action of epispastics appear to have undergone some change. In an article on *tic douloureux*, published in the *American Journal of the Medical Sciences*, for August, 1834, he observes: “the common practice of establishing issues immediately on each side of the affected vertebra is bad. They should be placed some inches from it, and the same remark applies to leeching; being near to, or in contact with it, instead of operating as divellents or counter-irritants, they may have a contrary effect, exacerbating the irritation of the spinal marrow; but especially the intensity of inflammation, which is so apt to follow caustic issues, should be avoided. By this circumstance alone, I have, in more than one instance, seen neuralgic pain, and the paralytic state, conspicuously increased, and each again relieved, on the reduction of the inflammation, by emollient poultices, &c. Moxa issues are greatly to be preferred to those produced by other means. They are less painful, more manageable, and decidedly of superior efficacy.”

This last opinion appears to be more philosophical, and the most in accordance with true experience. If we are desirous of irritating the vessels of any organ, we apply the blister, if possible, so near to it, that we may implicate branches of the same vessels and nerves that proceed to the affected part. If, on the other hand, we wish to produce revulsion or counter-irritation—as is almost invariably the case, when we have recourse to epispastics—we carefully avoid applying them to branches of the same vessels and nerves, and seek out a surface where no such identity of nervous and vascular supply can exist. We can

thus understand that a blister to the shaved scalp may be improper or proper, according to the precise character of the disease of the encephalon, for the removal of which it is applied. In encephalitis, for example—affecting the encephalon or its membranes—a vesicatory on the head is too near the seat of the disease, and can scarcely fail to add to the internal mischief; inasmuch as it occasions an augmentation of vital manifestations towards the part irritated, which can only be accomplished by increasing those of the whole head, and consequently of the part diseased. Besides irritative irradiations cannot fail to proceed through the media of communication between the exterior and interior of the head; and hence it is, that a *coup de soleil* produces encephalitis;—the erethism, occasioned externally by the solar rays, being speedily propagated to the organs within the cranium. In like manner, the irritation of a vesicatory, and of exciting ointments, applied to the head in cases of porrigo, has produced serious mischief of the brain by the same mode of extension; and in inflammatory affections of the joints, strong revellents applied over the joint may add to, rather than detract from, the mischief.

In the generality of cases, however, in which cutaneous revulsives appear to be indicated, there need not be much apprehension from placing them as near the affected organ as practicable. Thus, in inflammation of the abdominal or thoracic viscera, the nervous and vascular distribution is so different in the parietes from what it is in the viscera, that we need not hesitate to apply our epispastics to the former, whenever the state of internal mischief suggests their propriety. But, although blisters may be improper in cases of violent encephalitis, before the disease has terminated in effusion, they may be clearly indicated after such termination, or whenever there is reason to believe that advantage may be derived from exciting the organic actions of the encephalon or its meninges. In the last stages of the form of meningitis, to which the name *hydrocephalus acutus* has been given by many nosologists, epispastics may be prescribed; but, unfortunately, in too many cases, without any well-founded prospect of benefit. In like manner, whenever the functions of an organ have to be aroused to greater activity, the application of a blister so near the organ, that the stimulation may be felt by it, may be made with advantage; but this plan of management would obviously be improper, when the organ is in a state of superexcitement.

The author has elsewhere remarked, that in external inflammation, in which the dilated state of extreme capillary appears to predominate over the excited condition of the vessel communicating with it, we often find the direct employment of excitants followed by the most happy results. In this way, blisters produce their good effects in superficial paronychia, and erysipelatous inflammation. In these cases of tegumentary inflammation, such a dilated and atonic condition of the extreme vessels generally, if not always, exists, which the stimulation of the vesicatory is often successful in removing. There are, doubtless, many cases of inflammation of internal organs, which would, likewise, be relieved by the application of excitants, but the organs concerned are generally so important to the economy, and so intimately

associated by sympathetic relations with those of the vital functions, that we dare not venture on their administration. Occasionally, however, we observe the reckless empiric exhibit them boldly in such affections, and we are, at times, surprised, that the extensive mischief which we had anticipated, has not supervened on their use. We could understand that gastritis might possibly be relieved by them, in the same manner as cutaneous inflammation, but we are astonished to discover, that their secondary effect,—that of hurrying the general circulation and augmenting the inflammatory tendency,—has not taken place to the degree we had anticipated. The efforts of a class of empirics, not uncommon in every section of the United States, has taught us one useful lesson,—namely, that there are diseases, usually and correctly esteemed inflammatory, and especially certain stages of such diseases, that are not aggravated by the internal use of powerful excitants, which seem, at times, to act more as revellents, by exciting the lining membrane of the stomach, and thus detracting from the intensity of mischief existing elsewhere.

From what has been said of the *modus operandi* of revellents, it will appear, that when we have recourse to them in inflammatory affections of internal organs, we avoid applying them so near the seat of the disease that it can be increased by their direct action; much farther than this the author's information does not extend: his experience, however, has induced him to infer, that the same amount of irritation, artificially excited, has had pretty nearly the same therapeutical agency, whatever may have been the part chosen for such irritation. The selection of a seat for the artificial irritation is often, indeed, sufficiently whimsical. It is an old remedy to apply a garlic poultice to the thumb in cases of toothache: the vesicatory is put behind the ear in ophthalmia; but, many cases of ophthalmia which had resisted artificial irritation, in this situation, have yielded to a vesicatory on the nape of the neck; and others, which have resisted both, have been removed by the same agent applied to the interior of the arm: perhaps, however, in these cases, the benefit has accrued from the aggregate of successive irritations rather than from any one of them. The origin of the choice of the interior of the arm was probably owing to the same idea that gave occasion to the epithet *cephalic* to one of its vessels,—some fancied connection between it and the head; but the good results are probably owing to the thinness of the skin, and to the greater sensibility of the arm, which render it a favourable situation for the induction of revulsion.

Again, by common consent, we apply our revellents to the feet and legs in apoplexy and other cephalic affections; whilst, in the same diseases,—where abstraction of blood by means of leeches, and some degree of counter-irritation are demanded,—the French prefer, that the blood should be drawn from the region of the anus. With them, greater attention is paid than with us to *revulsive bleedings*, and although their notions on the subject may be carried to a somewhat chimerical extent, there can be no doubt, that a revulsive influence may be exerted, in many cases, by a proper choice of vessels;—the afflux to the vessels, which are discharging the blood, deriving somewhat from organs to

which it is already directed in too great quantity or force. In the case before offered—of encephalitis liable to be augmented by epispastics applied to the shaved scalp,—we rarely observe, in American or British practice, the revellent applied at a greater distance than the nape of the neck. There is no reason, however, why this part should be preferred to the top of the sternum,—where the author is in the constant habit of applying it in such cases, and, as he conceives, with full advantage; whilst there is a cogent objection to the former situation,—its rendering the position on the back uncomfortable, and, at times, impracticable, owing to the abraded surface being subjected to attrition on every change of position of the head. Practitioners have been so little in the habit of reflecting on the mode in which epispastics produce their salutary agency in these cases, that they rarely select a more convenient, and yet equally effective, centre of irritation, at a greater distance from the seat of the mischief. Many of the French writers recommend blisters to be placed upon the arm, or between the shoulders, in encephalitis; but it has always appeared to the author, that the top of the sternum is perhaps the least objectionable situation, when counter-irritants are demanded in head affections, that are accompanied by exaltation of the organic actions.

After all, in general rules for the use of revellents, and their adaptation to special morbid conditions, the physician must be altogether guided by sound physiological principles. It is clear, that any agent belonging to the class of excitants, when properly administered, is capable of exerting a derivative effect, and may be beneficially used whenever, owing to the concentration of vital manifestations on any important organ, it is considered proper to divert them elsewhere.

Therapeutical application of Revellents.

After what has been said of the great principles of action of revellents, and of epispastics in a general manner, their adaptation to particular diseases will be intelligible.

Intermittents.—During the paroxysms of an intermittent, revellents can rarely be demanded. When the cold stage is unusually protracted, and no signs of reaction make their appearance about the time when they might be expected,—and especially in the pernicious forms of intermittent, which occasionally prove fatal in the congestive condition of the cold stage,—substances, belonging to this class of medicinal agents, may be had recourse to with advantage, for the purpose of concentrating the vital manifestations towards some point of the cutaneous surface, and thus detracting from the accumulation that may be present in an internal organ. With these views, epispastics may be applied over the epigastric region;—this part of the cutaneous envelope being chosen in consequence of its vicinity to the epigastric nervous centre, in which, rather, perhaps, than in the stomach, we ought to place the ‘centre of sympathies.’ The epispastic, which we choose in the con-

gestive stage of an intermittent, is usually flour of mustard, applied in the form of *sinapism* or *mustard poultice*; and we select it, because its operation is more speedy than that of plaster of cantharides. The irritation, produced by it in the nerves and vessels of the skin, is soon extended in all directions; the ganglionic, cerebro-spinal, and spinal systems of nerves feel the influence, and, in this way, new force is communicated to the vital movements; reaction becomes established, especially if recourse be had, at the same time, to appropriate adjuvants; and all apprehension of death during the stage of congestion vanishes.

The same remarks are applicable to similar conditions occurring in diseases of a different character: and, accordingly, whenever a state of depression, or of collapse, occurs, which is dependent upon mischief existing in some of the great systems, or in some particular organ or part of such systems, we endeavour to derive from the organ or part morbidly implicated, and to attract the vital manifestations to an unimportant part of the organism, by means of the artificial irritation, which epispastics are capable of producing. Hence it is, that the practitioner employs them in cholera, both during the state of erethism,—as indicated by the copious exhalation and secretion from the mucous membrane of the alimentary canal, with the pulse still exhibiting sufficient energy of circulation,—and in that of the oppression and depression of the vital forces, which characterize the state of collapse:—in the *former* case, to have the benefit of the revulsive medication; and in the *latter*, of both the revulsion and stimulation, which epispastics are capable of effecting. In all cases, where time is valuable, and revulsion important, the practitioner has recourse to rubefacients whose action is speedy; but, where the case is not so urgent, vesication by means of cantharides, is at times preferred. It has been already remarked, that the latter operation or agency on the frame is essentially that of the former; and that, where great prostration exists, the separation of the serum, occasioned by blisters, is rather an objection than an advantage. It would be well, therefore, perhaps, that the practitioner should, in all such cases, place his confidence altogether in the former; and this appears to be the feeling of most therapeutists of the day. Rubefacients are, indeed, now employed in states of disease, in which, a century ago, they would have been looked upon as wholly inoperative or injurious. At that time, the idea, almost universally prevalent, was, that the good effects of blisters—and the same applies to issues, setons, &c.—were dependent upon the discharge; and, as rubefacients produced no discharge, they were necessarily discarded. Here, again, therapeutical observation reconducted the speculatist to the true path, and taught him practically, that rubefacients are valuable revellents; and, accordingly, as in too many cases, the opposite exclusive view was embraced by many; and it is now asserted by several, that no good whatever is occasioned by the discharge,—the whole benefit being ascribable to counter-irritation, or revulsion. Certain it is that the main, if not sole remedial effect of cutaneous revellents, in the cases under consideration, would seem to be independently of, and notwithstanding, the effect produced on the system by the separation of the fluid of the vesication from the mass of blood.

During the state of exalted action, which succeeds the cold stage of an intermittent, recourse to this class of remedial agents is seldom necessary; and the same remark applies to the sweating stage. Complications rarely exist, which can demand the administration of revellents; and, if any such should arise, the practitioner has to be guided by great general principles. The last remark applies equally to the accidental complications, that may exist during the stage of apyrexia. Where a person has been long resident in a malarious region, or has been subjected to repeated attacks of intermittent fever, visceral infarctions and indurations are apt to be induced, which may act as *foyers* of irritation; and prevent the tonics, that are administered, from exerting their proper agency on the nervous system, so as to break in upon the morbid association, which keeps up the periodical exacerbations. In these cases, it may be necessary—should the disease be of the usual indolent character, which we witness in the indurations of the spleen and liver, to which the vulgar have usually given the name *ague-cake*—to attempt their removal by revulsive remedies; and, with this view, epispastics are occasionally applied over the abdomen; or revellents of a more general nature are prescribed,—as preparations of mercury or iodine,—which, by inducing a new artificial condition of the system, derive from the one already existing; and occasion its removal.

Such are the remedies usually employed in these cases, as well as in all those that indicate the presence of local mischief; and for which such a system of medication seems to be more appropriate than the vigorous employment of antiphlogistics. If we inquire into the exact etiology of these visceral engorgements, we may often find that they are really only the results of a morbid condition elsewhere, as in the lining membrane of the alimentary canal, the irritation extending from it to the parenchymatous viscera, and occasioning inflammation and its results in those organs; but, in whatever manner induced, and even if complicated with some degree of gastro-enteritis, the plan of treatment recommended is best adapted for their removal.

It is not alone, however, in such accidental complications, supervening in intermittent fever, that revellents have been regarded as appropriate. They have been advised in the apyrexia, with the view of preventing the subsequent paroxysm. The mode in which they probably act, in such cases, is by attracting the nervous and vascular afflux to the part, and concentrating the attention of the patient to the new point of irritation. Their operation is exerted in the same manner as mental tonics; and as the animal magnetiser, Perkinist, &c., successfully operate on their patients. In cases like these, the remedy ought obviously to be applied as near to the anticipated paroxysm as possible; and, therefore, epispastics, which produce their effects at once, are indicated; those which, like ordinary blisters, require a length of time for the accomplishment of the necessary degree of irritation, and which have that irritation diffused through a period of hours, are by no means as well calculated for destroying the continuity of the chain, as those that make a rapid and powerful impression. A few drops of hot water let fall upon a naked surface, or the actual cautery applied a little before an expected paroxysm, would, accordingly, be the most appropriate

agents; but the acquired dread of fire—although one of the essentials to their due efficacy—occasions so much repugnance to their employment, that they are scarcely ever used; and, indeed, we possess in agents belonging to other classes—especially to that of tonics—means so efficient for breaking the morbid chain, that we very rarely have recourse to those of the class now under consideration;—mental revellents or mental tonics being almost wholly handed over to the practisers of animal magnetism, and its kindred arts, for operating on the minds of the feeble; and for the encouragement of mystery, credulity, and delusion.

Remittent and continued Fevers.—In remittent and continued fevers, epispastics are not indicated during the violence of action, which usually attends the first periods; unless, indeed, in those fevers that are adynamic from the commencement, and are complicated with local mischief, when they may be required, especially if blood-letting—general or local—has been premised. It is chiefly in the latter periods of continued fever, when the violence of febrile irritation has, in some measure, passed away, that revellents, applied to the cutaneous surface, may exert a salutary effect, by localizing that which has been general; and concentrating the disordered action towards one point—and that an unimportant one—of the economy.

The practice, pursued by some, of attempting to derive from every organ that is incommoded by the irregular afflux of blood, which occurs in the course of remittent fever, by the application of an epispastic whenever symptoms of such partial afflux present themselves, is not judicious. It is apt to keep up irritation, and to add to disordered movements, by those irradiations, which are induced by epispastics, and which in the opinion of M. Broussais, add to the intensity of inflammation of the gastro-enteric mucous membrane. There is a tendency, in all these fevers, to run a definite course, and, unless disorganising inflammation occurs in some part, to terminate in health. The true method of treatment is, therefore, to allay all irritations, wherever existent, as effectively as possible, and not to adopt any course, during the period of superexcitation of the organic actions, which can augment them. But when, as already said, those disordered movements have persisted until the period at which the disease ordinarily yields, and appear to be likely to be farther prolonged, the application of revellents, which excite a new action in the system generally, or in some part of it, frequently destroys the chain, and restores all to harmony. It is thus, that a blister acts beneficially in such cases,—not as an excitant proper, as elsewhere shown; and that we have the valuable revellent effects of mercury, when pushed so as to affect the system in protracted disease. If we can once succeed so far as to induce a new action by means of this agent on the system generally; if we can cause the gums to fall away from the teeth; the mouth to be slightly sore, and mercurial fever to be established, we may, generally speaking, look forward, with confidence, to a favourable termination; owing to the incompatibility of the original and the artificial irritation in the system at the same time. The very fact of our being able to induce a mercurial disorder, is, of itself, an element of

favourable prognosis ; for, in the worst cases of continued fever, we may in vain attempt to arouse the action of the absorbent vessels. The gastro-enteric mucous membrane—and indeed the whole system—is so excited, that no absorption can be effected, whatever may be the amount of mercurials exhibited. These circumstances have led to the belief, strenuously advocated by some, that so long as high febrile action continues, we cannot affect the system by mercury, and that when we do, it is an evidence that the fever has abated, or is about to terminate,—not that the mercury has broken in upon the morbid catenation.

Exanthematous Fevers.—In exanthematous fevers, revellents are chiefly employed for the removal of local mischief occurring in the course of the malady. In all these complaints, the mucous membranes are more or less inflamed ; and, at times, to such an extent as to require the ordinary treatment adapted for internal inflammation. It must be borne in mind, however, that in such diseases, occurring in young children, the dermoid system is very liable to assume gangrenous inflammation, under the irritation of an epispastic. It behooves us, therefore, to be cautious ; to be satisfied that it is imperatively demanded ; to place some substance between it and the skin—as before inculcated,—and not to let the plaster remain on too long. Those precautions are proper, indeed, whenever it is deemed requisite to apply blisters in the diseases of early childhood ; for, although such disastrous results are more likely to occur, where the cutaneous system is morbidly affected, they may supervene in diseases in no respect exanthematous.

Inflammation.—It is in the different phlegmasiæ, that revellents are most frequently, and advantageously employed ; and there is not an agent of the class, which has not been used in special cases. Whilst the inflammation is active, our attention must be directed to those great sedative agents, on which our main reliance is habitually and properly placed ; but, when the violence of the phlegmasia has been got under ; and exaltation of the vital forces continues in the diseased part, revellents may be prescribed with the best prospect of success. It has been before observed, that many of the practitioners of continental Europe are of opinion, that blood, drawn from particular parts of the body, in diseases of certain organs, is more efficacious than when the same quantity of fluid is taken from other vessels. This system of revulsive blood-letting is a relic of antiquity. Of old, the vein from which the blood was to be taken in any disease was specified ; and, at one period, great discussion was carried on, respecting the propriety of bleeding from the vein of the arm of the affected side in pleuritic inflammation, or from that of the opposite one. Strangely enough, an appeal was made to the Emperor Charles IX. ; but, before he delivered his judgment, he was bled for pleurisy, and died ; and his death was of course ascribed to the blood having been drawn from the wrong side. These injudicious controversies are no longer carried on ; and practitioners have settled down to the opinion, that the effect upon the system is the main thing to be regarded ; yet a modern therapeutical writer, Conradi, maintains, that in thoracic inflammation blood should be drawn from the arm

of the affected side. This is a topic, however, to which allusion will be made hereafter. It will be then seen, that there may be cases in which greater advantage may be derived from emptying the vessels of the inflamed organ, than where the blood is taken from a more distant vessel. 'Revulsive bleeding'—as it has been termed—alone concerns us at present. American and British practitioners attach, perhaps, too little importance to this matter, although too much weight is, doubtless, given to it elsewhere. If we are in the habit of exciting a revulsion in the feet, or in the rectum, in encephalic affections, there is some show of reason in our drawing blood from the feet or from the neighbourhood of the anus; and when the author has seen it practised in France, by opening a vein in the foot, and immersing it in warm water,—or by applying leeches around the verge of the anus, a greater effect, it appeared to him, was produced on the system by a smaller loss of blood, than where the abstraction of the fluid was made from the exterior of the head—for example. Many of the European practitioners are firmly of this opinion, and they, consequently, have recourse to these revulsive bleedings in all such affections.

Revulsive bleedings from the neighbourhood of the anus were so common at one time in Great Britain, as to be alluded to in the popular songs. Thus, a wit of the time of the "Rump Parliament,"—alluding to Cromwell's hunting the members out of the house by military force,—observes:—

"Our politic doctors do us teach,
That a blood-sucking red coat's as good as a leech
To relieve the head, if applied to the breech."

Although doubts may be entertained regarding the propriety of placing any stress upon the revulsive effect of general, there can be none as respects the action of topical, bleeding. Often, indeed, when we are in doubt regarding the propriety of the former; and when the degree of phlegmasia seems to require the farther abstraction of blood, we can obtain the most striking advantage from the combination of revulsion and evacuation, which cupping or leeching affords. It is, in truth, in such cases, that we avail ourselves of the use of these mixed agents, rather than of more powerful simple revellents. These we usually postpone, until the inflammatory action has been more decidedly reduced. When, therefore, we wish still farther to diminish the quantity of circulating fluid or the activity of the circulating forces; and, at the same time, are somewhat afraid of general blood-letting; and when we do not consider the condition such as to admit of the application of more active counter-irritants—as blisters—we have valuable agents in means, that remove a small quantity of blood from the vessels, and are, at the same time, decidedly revellent in their action; and it has always seemed to the author, that the good effects of cupping and leeching, in many cases of internal inflammation, have been as much dependent upon the latter operation as upon the former. Even the simple application of cups, without the scarificator, constituting *dry cupping*, is often signally salutary; and where there is, in addition, the irritation, or series of irrita-

tions, produced by the wounds of that instrument, the revulsion is still more marked. In the same manner, the punctures made by leeches are the source of salutary derivation.

It has been the opinion of many therapists, that local bleeding is of but little service, compared with bleeding from the larger vessels; and that the effects of both are proportionate to the quantity of blood taken. Were this the sole effect, that local blood-letting is capable of producing, the objection would be valid; but such is not the fact. It has been already stated, that revulsion is an important agency;—not less so, perhaps, than depletion; and hence cupping and leeching may be employed successfully in cases, in which the same, and even a larger amount of blood taken from the arm would be far less efficacious. When, therefore, we are desirous of evacuating the vessels, and of diminishing the vital actions generally, and, through them, those of any part affected with hyperæmia, we can employ no substitute for general bleeding; but where the inflammatory or subinflammatory irritation is not to such an extent as to demand the use of the lancet, or to require much loss of blood, topical blood-letting may still be beneficially employed. In all fevers, consequently, where there is a complication of local hyperæmia, but to no great extent, we adopt topical revulsive bleeding unhesitatingly and freely; and, in the practice of the Broussaist,—if any such there be at the present day,—it is used in most cases of fever to the exclusion of the lancet; leeches or cups being applied over the epigastric region, in accordance with the views of that pathologist, who, as often observed, placed the local origin of all fevers, or of most fevers, in the gastro-enteric mucous membrane. A like treatment is suggested by the views which regard dothinenteria or follicular gastro-enteritis, as the cause, essence, or consequence of ataxic and adynamic fevers.

There is no variety of revulsion that has not been employed in the management of the phlegmasiæ. The author has already remarked that every local stimulant, whatever may be the organ or tissue on which it acts by preference, is a revellent; and, accordingly, all local stimulants are used in the treatment of inflammation. Epispastics, too—our great counter-irritants—are employed under the like circumstances; and the operation of all, in the removal of disease, is the same.

As regards local stimulants, we rarely have recourse to them as revellents, until the time has come when we can adopt advantageously the whole revulsive system of medication. There are cases of inflammation, however, in which the inflammatory chain may be at times severed, at an early period, by revellents. The author's friend,—Dr. R. H. Thomas, of Baltimore, Professor of Obstetrics in the University of Maryland,—informed him, that in cases of mastitis or mastodynia apostematosa occurring after delivery, when the symptoms have strongly threatened suppuration, he has completely and suddenly removed the hyperæmia by a combination of sulphate of magnesia and tartrate of antimony and potassa, given so as to produce full vomiting and purging. In this way, an afflux of vital activity was provoked towards the abdominal organs, and a corresponding derivation took place from the inflamed mamma. A similar course of treatment is said

to have been found useful even in cases of peritonitis; but notwithstanding the salutary revulsion that might be effected by the vomiting, apprehension may be entertained that irritation, excited in the intestinal canal by the cathartic, might be propagated, by contiguous sympathy, to the part labouring under inflammation; and that more harm might accrue from the excitation, thus occasioned, than good from the revulsion.

Under the different classes of remedies that act as local excitants allusion has been made to the revulsion they are capable of operating, and to the cases of disease in which they have been employed by reason of this operation. It will not, consequently, be requisite to dwell upon them here. It may be merely observed, that whenever we consider internal revellents to be indicated in cases of hyperæmia of an internal organ, we generally choose the lining membrane of the intestinal canal on which to effect such revulsion; and, accordingly, emetics and cathartics are our most valuable internal revellents.

In all the varieties of internal inflammation, when the exaltation of organic actions has been reduced by appropriate medication, epispastics are employed; and the blister of cantharides is usually selected for this purpose. Sometimes, however, nitrate of silver, red iodide of mercury, ammoniated lotions, &c., are chosen, where cantharides are known to irritate inordinately, or where the object is to excite vesication more speedily. Of the best mode of applying those agents, and the great general principles to be attended to, mention has been made already.

When we are desirous of maintaining a succession of revulsions, or a constant revulsion, we employ either repeated blisters, or keep the blistered surface discharging by the application of blistering salve; or we have recourse to some of the other epispastics, as moxa, the seton, the issue, ointment of tartrate of antimony and potassa, &c., &c. The last agent is well adapted for cases of chronic inflammation and for phthisis; because, whilst the pustules, induced in any one part of the exterior of the thorax, or elsewhere, are going through the stages of increment and maturation, a fresh crop can be elicited on some other part of the chest; and thus a succession of irritations may be developed, which, as before said, is more beneficial than one that is permanent. In these, and similar cases, therefore, pustulation, effected by this ointment, is preferable to the issue or the seton, which, when once introduced, are permanent so long as they are permitted to exist; and as their good effects are mainly owing to the irritation and consequent revulsion, and as the system soon becomes accustomed to the discharge, and advantage can scarcely be expected from it, it is better to select more cleanly and less objectionable counter-irritants. It is at times, however, difficult to induce the patient to submit to any kind of epispastic, or to persevere in the use of those, which, like an ordinary blister, or ointment of tartrate of antimony and potassa, may require a repetition of the application. It may, therefore, be advisable to fix upon a method of revulsion, which, when once established, can be maintained without difficulty: and, for this reason simply, the issue, or seton is often selected, especially in hospital practice. There are situations, too, in which there may be some difficulty in our having the remedy properly applied, unless it is established at once;—when the

patient, for instance, is compelled to subject himself to the inconvenience of a constrained posture,—as where the vertebral column is affected with chronic inflammation, and the bones themselves with caries. In such cases, we insert a seton, or establish an issue, on each side of the affected vertebra, and keep this open as long as we think the diseased condition requires it. Still, even in these cases, a succession of revulsions would, probably, be more effective than this protracted and constant irritation.

Moxa is rarely employed in the more active inflammations. It is more commonly used in those cases, in which the seton or the issue is demanded; and where it is desirable to break in upon a morbid catenation that has been long existent. A centre of fluxion is formed in all these cases; the vital manifestations are directed towards the part artificially irritated; and, at times, the derivation is so complete, that the disease is removed, as it were, by a charm. In this way, moxa occasionally produces good in mania. The author has applied it in some cases with the effect of so completely directing the attention of the maniac to the cauterized part, and towards the artificial irritation there established, that it has broken in upon his abstractions, aroused him to consciousness, and been followed by decidedly beneficial results.

What has been said of the general rules for guidance in the application of revellents, near to, or at a distance from, the diseased organ, will render it unnecessary to say more here, than to remind the reader, that where revulsion has to be operated, the counter-irritant must not be applied over the same vessels and nerves, that are concerned in the lesion. A part of the body must be chosen, whose vessels and nerves are not so connected with the seat of the disease, that when the nervous and vascular afflux is solicited into them, the exaltation of action may be participated in by those of the part affected.

In chronic ophthalmia, it is very common for the unprofessional to select the interior of the arm as the best locality for a seton or issue; but, although this situation may have been chosen originally for the reasons before mentioned, connected with the idea that some more particular relation exists between the vessels of the arm and those of the head, the custom is kept up, perhaps, in consequence of as little inconvenience accruing from the presence of the issue there, as in any part of the tegumentary surface that could be selected for the purpose.

As in cases of long sustained febrile irritation, so in those of an inflammatory character, when they have become chronic; mercury is a valuable revellent. By the new action which it establishes, it breaks in upon the morbid condition more effectually than any other agent. It is in such cases, too, that we frequently see the most marked results from the revulsion effected by change of air, and of all the physical influences surrounding the individual; but this course can be adopted only when all active disorder has subsided.

Arthritic Fevers.—From the great leading rules laid down with regard to the employment of external revellents in the phlegmasiæ in general, it is unnecessary to occupy time and space with the special consideration of individual maladies. Allusion may be made, how-

ever, to one of those singular discrepancies in medical opinion, of which we have, unfortunately, too many examples; but which generally, perhaps, owe their origin to defective observation or reflection, or to both. It regards the propriety of employing epispastics in rheumatism and gout. "Of the utility of blisters in rheumatism," says Dr. Chapman, of Philadelphia, "no one doubts. Yet even here they are productive of harm, if prematurely applied, and, where it can be conveniently done, should be preceded by general evacuations and local detractions of blood. My conviction is, that they are much better adapted to chronic than acute rheumatism, almost always proving serviceable in the former instance, and especially when they induce the suppurative process. By some writers it is recommended to vesicate the affected part in regular gout, and, as it proves so beneficial in some analogous cases, we might imagine, that it would be attended with the same results; on trial, however, I have been disappointed, and no longer employ applications of this nature. It has, indeed, been alleged, that they have the effect of repelling the disease on some internal part of more value to life, and hence are hazardous measures. But such applications are the very best means to invite and fasten down, if I may use the expression, gout on the extremities, and I can have no idea of a remedy blowing hot and cold in this way." It is proper to remark, however, that these views of Dr. Chapman were published many years ago. In his recent work on 'Eruptive Fevers,' &c., (Philadelphia, 1844,) he says his own experience with blisters in gout "is too limited to decide confidently on the matter." "But," he adds, "from analogy, as well as on account of what I have seen of their operation, I presume that, after a partial reduction of the phlogosis, they would be serviceable—which opinion is strengthened by the consideration, that counter-irritation by some means seems always to have been a favourite practice in such cases."

On the other hand, Dr. A. T. Thomson thus expresses himself on the same subject:—"In gout and rheumatism, the application of epispastics, whether vesicants or rubefacients, is more problematical. 'Blistering,' Dr. Cullen remarks, 'is a very effectual means of relieving and discussing a paroxysm of the gout, but has also frequently had the effect of rendering it retrocedent.' I have little experience of the truth of this observation in gout, having scarcely ever ordered the application of epispastics; but, in acute rheumatism, I have so frequently seen the most alarming translation of the inflammation to the vital organs, that I cannot too strongly denounce their employment in this disease."

The reader is referred to a preceding page for the analysis, which the author has endeavoured to make of the action of revellents in the changeable phlegmasiæ. They are signally applicable to the present inquiry, both rheumatism and gout belonging to these very phlegmasiæ. It was there remarked, that it is by no means clear, that the artificial irritation, excited by revellents, can be used in such cases with perfect impunity. The irritation excited by the epispastic may, indeed, be added to that which appertains to the disease; and if there be a disposition in the phlegmasia to change its seat, or to extend to analogous structures,—

the gouty, or rheumatic irritation in such structures may be augmented by it; but it is not easy to see that it can have the effect, either of "fastening down" the gout on the extremities, according to the view of Dr. Chapman; or give occasion to metastasis, according to that of Dr. Thomson. The disease itself—as well as rheumatism—is metastatic or changeable; and this, whatever may be the plan of treatment pursued, although the author is not prepared to say, that such change of seat may not be promoted by certain agencies rather than by others. He has had the misfortune to witness several cases of serious pericarditis and endocarditis occurring in the course of acute rheumatism, although neither blisters nor any other applications had been made to the affected joints; yet he has little doubt, that had they been employed, the metastasis, or extension of the disease, would have been ascribed by Dr. Thomson, and by those who think with him, to the epispastics.

But although difference of sentiment exists regarding the effects of epispastics in acute gout, and acute rheumatism, practitioners are agreed as to the benefits to be derived from them, when the gout is atonic, and the rheumatism chronic. They are then used by all; and in the latter disease especially, revellents of almost all kinds are more or less prescribed;—all the varieties of epispastics are applied in some condition or other, and by some practitioner or other; the urinary organs are irritated by the turpentine, whose action in such cases is wholly revellent; and, in the cases of rheumatism, or neuralgia, to which the terms *lumbago* and *sciatica* have been appropriated, the excitation, produced in the urinary organs, exerts a salutary agency,—the new impression, made there, deriving, or detracting from the neuralgic condition in the lumbar or coxal region. In some of these cases, the use of phosphorus, or moxa, or the actual cautery in its ordinary form of application, has destroyed the morbid action when other external revellents had failed. It is in such cases, too, that the new nervous impression made by acupuncture is so advantageous.

In consequence of the easy absorption of the cantharidin when the flies come in contact with an abraded surface, blisters have been considered improper in inflammatory conditions of the urinary organs; but the plan, to which the author has already adverted, of placing a material between the plaster and the skin, obviates this objection; and permits counter-irritation by those agents to the same extent as if the inflammation were seated in any other organ.

Hæmorrhage.—The remarks, that have been made on the employment of revellents in inflammation, are equally applicable to hæmorrhages. When hyperæmia exists in any tissue, the action of a revellent detracts from that hyperæmia, whether its presence be indicated by the ordinary signs of inflammation, or by the occurrence of hæmorrhage. Accordingly, the various forms of revellents are prescribed in these cases with advantage. Emetics and cathartics exert their efficacy in hæmorrhage rather by their revulsive than by their depleting or evacuant properties; and the great general principles that guide the practitioner in the administration of revellents in the phlegmasiæ must regulate him here. It has been before remarked, that substances or

agencies, belonging to this class, often act in the most salutary manner as indirect astringents, by causing a diversion of the blood from the seat of the hemorrhage; and that in this way the application of cold to the nape of the neck, and charms, are hæmastatics. Led by the great principles referred to, we excite the feet, or the rectum, in apoplexy; apply vesicants, suppurants, or rubefacients to the exterior of the thorax in hæmoptysis,—endeavouring, in this manner, to establish a centre of fluxion in some part of the organism, which does not receive its blood from the same arterial trunks as are concerned in the hemorrhage. Even in cases of the less active and passive kinds of hemorrhage, advantage is derived from the employment of revellents; and they are, consequently, amongst the remedies most frequently used, whenever a discharge of blood from any set of vessels is kept up for a length of time; precisely for the same reason that we have recourse to them, in prolonged morbid conditions of any internal organ.

In the hæmoptysis, that is symptomatic of phthisis, and in phthisis in general, revellents are more relied upon than any other class of remedies; and, if they fail, as almost every agency does when the disease is once fixed in the pulmonary tissue, we cannot look, with any well founded expectations of benefit, to any other division of therapeutical agents. The revulsion is here variously effected;—sometimes by cantharides; at others, by tartar emetic ointment, moxa, issues, the seton, &c., &c. The object being to establish and maintain a centre of fluxion on the exterior of the chest, a succession of blisters, or the tartar emetic ointment, is well adapted to the case; but the issue or the seton, when once inserted, being easily kept up, is preferred by some physicians and patients.

Diseases of the nervous system.—With regard to the employment of revellents in affections of the nervous system, much need not be said. The author has already spoken of their utility in *apoplexy*, when considering their use in hemorrhage. In *paralysis*, epispastics are often had recourse to, but never, perhaps, with the view of producing revulsion. They are employed altogether as excitants proper; and have, accordingly, been considered under that division of medicinal agents.

In *mania*, every variety of revellent has been used. Whether the disordered intellect has arisen in the ordinary course of life, or in the puerperal state; whether it has been hereditary or acquired, the mischief has too often been regarded as requiring exclusively physical management; and most of the agents, that have been advised, have been of a kind adapted for repressing inordinate organic actions. That the disease is of a physical nature, or dependent upon an altered condition of the organ, through which the mental and moral manifestations are elicited, is perhaps unquestionable; but it is not of such a character, in the majority of cases, as to be removed by those agents, that are adapted for removing a hyperæmic condition of the encephalon; and, whether these, or, indeed, any physical agents have to be employed, must depend upon the particular circumstances that occasioned, or are present, during the disease. As a general rule, we are constrained to confine the treatment to the influence which we can exert on the encephalon through the *moral*; and, by a proper application of MENTAL

REVELLENTS—if they may be so termed—to break in upon the insane hallucinations. A modern writer, Dr. Gooch—in a lucid and philosophic essay on the “Disorders of the Mind in Lying-in Women”—has the following remarks, which are applicable to mental alienation in general. “Whatever may be the causes which excite these diseases, the most important question still remains to be considered :—what is that morbid state of organization on which the disorder of the mind depends? This is the proper object of medical art. We have no power by medicinal agents of relieving a disordered mind, excepting indirectly through the disorder of the body with which it is connected. It is impossible, therefore, to stir one step in the treatment of the disease without first ascertaining what this disorder is ; or if different in different cases, what they are, how to discriminate them, and whether experience shows that one is more common than the other. There is a strong disposition, not only popular but professional, to attribute raving of the mind to inflammation of the brain. Perhaps it originates in this—that the disorder of the mind with which we are most familiar is drunkenness, which is known to be caused by spirits, and to be cured by temperance. Mania is called brain-fever, and the sight of a raving patient instantly suggests the thought of cupping-glasses, iced-caps, low diet, and purgatives. This view of mania is, when it occurs in childbed, still farther corroborated by the popular notions about lying-in women. If a woman becomes deranged in childbed, it is said not only that she has a brain-fever, but that the milk has flown to her brain, hence the term ‘mania lactea.’ Dr. Denman says, that in his time it was a prevalent notion among the people, but an obsolete one in our profession ; and formerly it was usual to attempt relieving the disease by restoring the milk and the lochia. It would be as good pathology to attribute puerperal fever to a suppression of the milk, and as good practice to attempt to cure it by drawing the breasts, fomenting the pelvis, or using any other local means for restoring these secretions. But experience and reflection lead to very different conclusions : they teach us that the disorder of the mind may be connected with very opposite states of the circulation, sometimes with inflammation or active congestion, for which depletion is the shortest and surest remedy ; sometimes with an opposite condition of the circulation, which depletion will only aggravate. Cerebral excitement does not necessarily depend on inflammation or congestion, nor is depletion, however moderate, necessarily the proper remedy. Cerebral excitement is often aggravated by depletion ; and in some cases, as I shall have occasion to relate, absolutely brought on by it. Now the question, what is the morbid state of organization on which puerperal insanity depends, must be determined in the usual way. There is only one safe mode of working the problem, by observing the causes which brought on the disease, the bodily symptoms which accompany it, the way in which it is affected by remedies, and the morbid appearances discovered after death. These points can be learned only by an attentive and thoughtful observation of cases, and will be best communicated by the relation of them.”

For the removal of most of those bodily symptoms, that are usually observed in mental alienation, much use is made of agents of the revel-

lent kind. If there be headache; suffused eyes; flushed face, &c., general blood-letting may be demanded; but usually the combination of depletion and revulsion, afforded by cupping, is sufficient for the evil, and more beneficial in its operation than general blood-letting. In furious mania, epispastics to the head, nape of the neck, or to the lower extremities, have been strongly advised by some; but although, as has been seen, they may occasionally break in effectually upon the abstractions, they frequently add to the excitement, by the irritation they produce; and cannot often be indicated. As a general rule, the soothing or abirritating system of management is required, and if the patient be indomitable by other agents, recourse may be had to the *douche*, which rarely fails. In all insane establishments an apparatus of the kind exists. It consists of a reservoir above the ceiling of the apartment, from the bottom of which a plug can be withdrawn, so that a column of water may be made to impinge on the naked head. The powerful revulsive impression made on the nervous system by the "shock" from the fluid rarely fails to tame the most furious. Even the cold dash or *douche*, or spout bath, is often sufficient for the purpose; and the means are always at hand. The head of the patient may be placed over a pail of water, over the edge of the bed, and water be poured from a watering pot, or other vessel,—the operator standing on a chair, and in this manner allowing the water to fall from a height. A professional friend informed the author of a distressing case, in which he employed this variety of the *douche* with signal advantage; and several such cases have occurred to the author himself. A lady, in consequence of the abrupt announcement that her son, a fine boy, was burnt to death, became frantic, and was completely unmanageable, until the *douche* was employed in the mode just described; under the operation of which she was gradually overpowered, and sank to sleep. Since the introduction of this agent, more violent means of restraint in mania have been almost abandoned; and, by analogy, the cold dash or *douche* has been employed with signal advantage in various other morbid encephalic conditions,—as convulsions, poisoning by opium, delirium tremens, &c.

Where mental alienation has persisted for some time, and adequate attention has been paid to appropriate seclusion, and to preventing, as far as possible, the intrusion of any insane idea, the most salutary revulsion is occasionally effected by that thorough change in all the physical influences surrounding the individual, which travelling affords. The new objects, which perpetually present themselves to the eye, keep the mind actively engaged, and prevent it from brooding upon any topic, which may have constituted the insane hallucination. Exercise and amusement out of doors are, indeed, amongst the most important of the agencies adopted in the treatment of insanity; and every well constituted private or public institution for the insane is provided with means for keeping the mind engaged, and amused. Some of the private establishments, in France and elsewhere, are admirably supplied in this respect. If the patient choose the more active games, of which there is an extensive selection; or if he prefer riding, or sailing,—for there is usually a considerable basin of water, in some part of the *Ferme*

ornée,—or if he select the exercises of horticulture or agriculture, he is always indulged, care being taken to discriminate, whether he be in a state to permit the recreation, with or without his keeper. The whole system of moral management is, indeed, one of revulsion. It consists in keeping the mind engaged on every topic except the one that is predominant; or, as the phrenologists would say, in having every cerebral organ of the mental and moral manifestations occupied, except the one which is prominently, if not solely, diseased.

Hysteria, the seat of which is the cerebro-spinal nervous system especially, is mainly treated by revellents, as by cupping over the sides of the vertebral column, or elsewhere; by stimulating injections; the cold *douche*; and nauseous *antispasmodics*, as they are termed;—all of which exert their beneficial effects through the new impression they excite on the nerves with which they come in contact, thus detracting from the nervous concentration towards some other point of the nervous system, and generally, perhaps, of the cerebro-spinal axis.

In *tetanus*, and *hydrophobia*, revellents are rarely used, if we except the cold affusion, which, in one case of *tetanus algidus* or tetanus arising from cold, that fell under the author's observation, removed all the spasmodic symptoms by the shock it occasioned.

In *convulsions*, *epilepsy*, and *chorea*, epispastics are rarely employed; and never without some accidental symptom is present, which appears to indicate their use. In the two last diseases, however, the most salutary operation is occasionally exerted by a thorough change of all the physical influences surrounding the individual. The disease appears, at times, to be kept up altogether by habit; and change of air and scene frequently break up the morbid associations better than any other agency.

In *neuralgic* affections of various kinds, the practitioner trusts mainly to the effect of new impressions made upon the nerves. In this way tonics act, and the same may be said of narcotics. It is in such cases that the use of galvanism—in its various forms of application—as well as of the mineral magnet, has been found efficacious, breaking in upon the morbid condition, by exciting impressions on nerves not implicated in the disease, and, at the same time, attracting the nervous influx and the attention of the patient to the nerves artificially excited. In like manner, cupping—both with the scarificator, and dry—is often beneficially employed as a revulsive agency.

Dropsy and hypertrophy.—From what has been said regarding the action of revellents—mental as well as physical—it can be understood, that in dropsies, as well as in hypertrophy of various kinds in the solid structures of the body, the different forms of revulsion may be advantageously employed. The reader is referred to the section on *EUTROPHICS*, and to those on the various local stimulants, for elucidations on this point. In hydropic affections in general, blisters appear to be more indicated where there is much local irritation, as in hydrothorax—which is usually a sthenic dropsy. Still, in all, they establish a new action in the nervous and sanguiferous systems; and cases are on record,

in which the discharge from the blistered surface has been so profuse as to constitute an outlet, as it were, for the fluid of the dropsy.

It is obviously impossible to point out every variety of morbid condition, in which revellents may be useful. They can easily be inferred by one, who has attended to the great general principles which the author has endeavoured to lay down. In other works he has pointed out the advantage to be derived from the revulsion, which change of air, society, and scenery, are capable of effecting in health: and an attentive consideration of both its hygienic and therapeutical relations and applications cannot fail to exhibit it as one of the most important of the agencies which we employ both in prophylactic and curative medicine.

SPECIAL REVELLENTS.

From the general remarks that have been made, it is clear, that every physical and moral agent capable of modifying the function of innervation, and, through it, those of circulation and secretion, must be capable of acting as a revellent; and, therefore, that all the classes of therapeutical agents hitherto considered, and most—if not all—those that have to come, must be esteemed capable of revulsive operation in particular cases. Enough has, however, been said in regard to them; and, therefore, under special revellents those only will be considered which act as CUTANEOUS REVELLENTS, comprising what have usually been classed together under the head of EPISPASTICS. The class will, however, admit of certain subdivisions, which may tend to facilitate the study of the *modus operandi* of the individual agents; most of which have been described under the head of Excitants, and will, therefore, require but a brief consideration here.

a. *Rubefacient Revellents.*

1. SINA/PIS.—MUSTARD.

The excitant properties of mustard have been described elsewhere, (Vol. i. p. 133,) and the fact that vinegar and other acids interfere with the formation of the acrid principle, especially in black mustard, has been particularly noticed, (Vol. i. p. 134). On this account it is advisable, that the *sinapism* or *mustard poultice* or *mustard cataplasm* or *mustard plaster*, should not be made with boiling vinegar, as directed by the London and Dublin Colleges; but that water of a temperature not exceeding 100° should be used, as heat itself appears to be injurious. It is always made extemporaneously, and, therefore, the framers of the Pharmacopœia of the United States have properly omitted it. As a local stimulant, its use has been pointed out elsewhere, (Vol. i. p. 476). It is likewise used as a revellent in various neuralgic

and other painful disorders of internal parts, where it is necessary to establish an action of revulsion speedily. Care has, however, to be taken where the sensibility is diminished, as in apoplectic and paralytic cases, lest it should be kept on so long, that vesication, and even sloughing may occur. Usually, where the sensibility is not much impaired, a stinging pain indicates that the excitant is taking effect; and, if rubefaction be induced, it ought to be removed, and the mustard be carefully washed off, should any adhere. The best plan, indeed, is to put the cataplasm between gauze, which prevents any adherence to hairs, &c. These ought, however, when numerous, to be shaved off, when the cataplasm is placed in immediate contact with the skin.

The strength of ordinary mustard varies materially. Usually, for simple rubefaction, equal parts of flour and mustard, mixed with warm water, will form a sinapism of the proper strength.

In violent neuralgic and other deep-seated pains, the sinapism is occasionally applied to excite vesication. For this purpose, it may be made altogether of flour of mustard. It is, however, a very painful application, and, unless carefully watched, may implicate the integument so seriously, as to give rise to alarming sloughing. Hence, it is not often used as a vesicant. Oil of turpentine is occasionally added to the sinapism to increase its excitant effect.

Volatile oil of mustard—OLEUM SINAPIS—is a powerful acrid, exhaling so strong a smell of mustard that the attempt to test its odour excites a violent pungent sensation in the nose, and tears in the eyes. Its acidity is so great, that its application to the sound skin immediately occasions a sense of burning, and intense redness and vesication in the parts with which it is made to come in contact. It is applied in two modes, according to the sensibility of the skin, and the effect it may be desirable to induce. These consist either in rubbing the liquid on a part of the surface, or in applying strips of linen wetted with it. The first method is advisable where the skin is delicate,—as in the cases of women and children, and in those whose sensibility has not been diminished, as by paralysis. When rubbed on the skin it speedily evaporates, exciting a sense of burning and redness, which disappears in a few hours. The application of the oil by means of strips of linen is adapted for skins which are thicker and less sensible, as well as for morbid cases, in which the sensibility is diminished. A strip or strips of linen dipped in it are placed upon the skin and suffered to dry, which generally takes six or eight minutes. The pain is often most violent, and sometimes insupportable; and is followed by redness and vesication. It has been extensively used in Germany, especially in cases in which a sudden counter-irritant is needed.

2. CAP'SICUM.—CAYENNE PEPPER.

Of the employment of powdered capsicum and *Tinctura Capsici*, as rubefacient revellents, enough has been said when treating of capsicum as an excitant. (See Vol. i. 473.)

3. AL'LIIUM.—GARLIC.

Garlic, by virtue of its acrid volatile oil—*Oil of Garlic*—is rubefacient; and the bruised cloves are sometimes applied to the feet in place of sinapisms, and with the same objects. A garlic poultice to the thumb is a popular revellent in toothache. It is rarely used, however, by reason of its very strong, and—to most persons—disagreeable odour.

The same may be said of 4. ALLIUM CÆPA, the *Onion*; and 5. ALLIUM PORRUM, the *Leek*; the bulbs of which, by virtue of their acrid principle, are rubefacient also.

6. AMMONIÆ PRÆPARATA.—PREPARATIONS OF AMMONIA.

All the preparations of ammonia are rubefacient; but *Liquor Ammoniac* is the one most frequently had recourse to. Under the head of Excitants it was stated, that *ammoniated lotions* had been highly extolled as revellents in recent times; and the modes of forming those of Granville, and the *Pommade Ammoniacale* of Gondret were given. (Vol. i. p. 501.) All these are powerful agents: in their strongest form, they give rise, in a short time, to rubefaction and vesication over the whole surface to which they are applied; almost as rapidly, indeed, as if boiling water were applied to the part. Their strength, may, however, be regulated so as produce either full vesication or simple rubefaction, by varying the proportion of liquor ammoniac. The mode of applying the ammoniated lotions is to impregnate a piece of cotton or linen, folded six or seven times with them, or a piece of thick and coarse flannel, and then place either of these on the spot to be acted upon, pressing the hand, at the same time, very steadily and firmly on the compress, over which there should be placed a thick towel, doubled several times, so that not only the evaporation of the lotion may be impeded, but the hand employed in pressing the application on the part may not suffer from direct or indirect contact with the liquid. Care must be taken, that the ammonia does not reach the eyes or nose.

As a general rule, the application ought not to be kept on longer than from one to six or eight minutes; and, sometimes, the good effects supervene in less than a minute; but, to excite the higher degrees of counter-irritation—as vesication and cauterization—as many as ten or twelve minutes may be necessary.

It is chiefly in neuralgic diseases, that the benefit of these rapid counter-irritants is most marked. The author has often employed them both in public and private practice; and in nervous and spasmodic diseases, and neuralgic and deep-seated rheumatic affections, the benefit has often been most signal. Severe pains have yielded rapidly; hyperæmiæ of particular organs have been diverted elsewhere, especially when blood-letting, and other sedatives had been premised; and in short, whenever revellents, sudden and rapid in their action, have been demanded, the ammoniated counter-irritants have effected everything that similar powerful revellents were capable of accomplishing; but no more. There

is an objection, however, that applies to these potent lotions,—that they are apt to occasion sloughs and sores, which are often considerable, and remarkably difficult to heal. This, it is true, may be partly prevented, by being careful, that the application is not too long continued; but, with the greatest caution, these results will supervene at times. When such is the case, simple dressings with emollient poultices will be found the best applications.

LINIMENTUM AMMONIÆ, LINIMENT OF AMMONIA. (*Liq. ammon. f. ℥j; Ol. oliv. f. ℥ij.*) This saponaceous liniment, of which *hartshorn and oil* is a variety, is often employed as a revellent in sore throat, as well as in lumbago, sciatica, and every form of rheumatic and neuralgic pain. It may either be rubbed on the part,—or a flannel, soaked with it, may be retained on the part of the cutaneous surface, which it is desired to irritate.

7. CANTHARIS.—SPANISH FLIES.

Cantharides—whose properties as an internal remedy have been described elsewhere, (Vol. i. p. 281,) are chiefly used to induce vesication; but they are employed, likewise, as rubefacients. The author has, indeed, remarked, that when they induce vesication, the fluid, abstracted from the cutaneous vessels, can scarcely be regarded as exerting much, if any, agency; and that the whole therapeutical influence would seem to consist in the rubefaction. Accordingly, a common object of the practitioner in the application of blisters is to induce redness of the surface; and, as soon as this is accomplished, to remove the blistering plaster; but even then vesication frequently results, in consequence of the impression which has already been made on the secretory vessels of the skin.

When the blistering plaster is applied to excite rubefaction only, it ought not to be kept on more than an hour or two. It is impossible to fix upon the exact time, as this may depend upon difference in the thickness of skin; varying strength of the plaster, &c., and therefore, the best plan is to raise the plaster gently, and remove it on the first appearance of redness; after which, a bread and milk poultice, or lint spread with cerate, may be applied. A common rubefacient liniment is made of tincture of cantharides mixed with soap or camphor liniment, (*Tinct. cantharid. f. ℥ss; Linim. camphoræ, seu Tinctura saponis camphorat. f. ℥iss.*)

LINIMENTUM CANTHARIDIS, LINIMENT OF SPANISH FLIES. (*Cantharid. pulv. ℥j; Ol. terebinth. Oss.*) Oil of turpentine dissolves the cantharidin, and the solution is a powerful irritant. It will generally excite rapid vesication; and requires to be reduced by the addition of olive or linseed oil, when the object is merely to excite rubefaction.

8. OL'EUM TEREBINTHINÆ.—OIL OF TURPENTINE.

Oil of turpentine—whose general properties have been described already, (Vol. i. p. 481,) is a powerful local excitant, and is used as a

rubefacient in many diseases. In long protracted fevers of an adynamic kind, it is rubbed, hot or cold, on the extremities, partly with the view of arousing the organic actions, and partly of localising a disease which is general. As a local rubefacient, it is employed in cases of deep-seated neuralgic and rheumatic affections of a chronic kind; and in sore throat and other internal inflammations. Applied hot, it has been used as a rubefacient to the abdomen in malignant puerperal peritonitis. It is considered to be the chief ingredient in *Whitehead's essence of mustard*; and the celebrated *Liniment of St. John Long* is said to have consisted of oil of turpentine and acetic acid suspended by yolk of egg.

LINIMENTUM TEREBINTHINÆ, LINIMENT OF TURPENTINE. (Vol. i. p. 483.) This may be employed in rheumatic and other affections, in which it is desirable to produce a rubefacient effect.

Oil of turpentine enters into the composition of *Linimentum cantharidis*, of the Pharmacopœia of the United States.

9. OL'EUM CAJUPU'TI—CAJ'EPUT OIL.

Cajeput or Kyapootie oil, (Vol. i. p. 488,) has been used, mixed with an equal quantity of olive oil, as a rubefacient liniment, in chronic rheumatic and neuralgic affections. It does not appear, however, to possess any virtues that do not equally belong to other essential oils; all of which, by the way, are rubefacient revellents; yet few are used as such, in consequence of their high price.

Fig. 159.



Abies excelsa.

10. PIX ABIE'TIS.—BUR'GUNDY PITCH.

Burgundy pitch is the prepared concrete juice of *Abies excelsa*, *Pinus Abies*, *Norway Spruce Fir*; SEX. SYST. Monœcia Monadelphia; NAT. ORD. Coniferae; which is a native of Germany, Russia, Norway, and other parts of Europe; and also of the northern parts of Asia. It is cultivated in England, flowering in May and June. It yields, by spontaneous exudation, *Common Frankincense*—*Abietis Resina* of the London Pharmacopœia,—Thus, of

the Dublin. From this, Burgundy pitch is prepared by melting in hot water, and straining through a coarse cloth, by which the volatile oil and impurities are separated. According to Dr. Pereira, the substance sold in the shops as Burgundy pitch is rarely prepared in this way; but is fictitious, the principal constituent being resin, rendered opaque by incorporation with water, and coloured by palm oil. One fabricator of it informed him that he prepared it from old and concrete American turpentine.

Burgundy pitch is hard, brittle, opaque, of a yellowish white colour, and of a weak taste and smell of turpentine. When applied to the skin it adheres strongly; and therefore forms an excellent material for a rubefacient plaster. Its chief constituent is resin, which is associated with a small quantity of volatile oil.

Spread upon leather, Burgundy pitch is used as a plaster,—under the names *Burgundy Pitch Plaster* or *Pitch Plaster*. A margin should be left on the leather free from the pitch, otherwise it will adhere to the clothes, and subject the patient to much inconvenience. It is used in various chronic affections of the chest and abdomen, and in cases of chronic rheumatic or neuralgic affections, where a plaster is applicable. It almost always excites more or less irritation of the surface, which may be limited to simple rubefaction; but at times extends to vesication, and even to ulceration. ✕

EMPLASTRUM PICIS CUM CANTHARIDE, PLASTER OF PITCH WITH SPANISH FLIES. *Emplastrum calefaciens, Warming Plaster, Warm Plaster.* (*Picis abiet.* ꝑss.; *Cerat. cantharid.* ꝑss.) This is an excellent rubefacient plaster, but cannot be borne by many individuals. For such the proportion of flies may have to be diminished; or they may not be tolerated in any proportion. It is adapted for all cases in which a rubefacient plaster is indicated.

Burgundy pitch enters into the composition of *Emplastrum Galbani Compositum* of the Pharmacopœia of the United States.

11. PIX CANADENSIS.—CANADA PITCH, HEMLOCK PITCH.

Hemlock Pitch is the prepared concrete juice of *Abies Canadensis*, *Pinus Canadensis*, *Hemlock Spruce*, a tree which flourishes in the British northern provinces, and in the more northern parts of New England, as well as in mountainous regions in the Middle States. The pitch exudes spontaneously from the full grown trees; and concretes on the bark. This is removed from the tree, broken into pieces, and boiled in water. The pitch rises to the surface, whence it may be removed, and purified by a second boiling. It may be freed from its impurities by melting, and straining through coarse linen or canvas.

Canada pitch, hemlock pitch, *hemlock gum*, as met with in the shops, is hard, brittle and opaque, like Burgundy pitch; of a dark yellowish-brown colour, and peculiar smell. When made into a plaster, it is a

mild rubefacient, resembling, in its properties, Burgundy pitch; for which it may be substituted.

12. CALORIC.

Heat, when applied to any part of the cutaneous surface, may be regulated so as to act as a rubefacient revellent. Thus, hot water, between 120° and 150° Fahr., operates in this manner; and hence, pediluvia and cataplasms exert an unquestioned revellent agency in many cases of internal inflammation. Occasionally, other rubefacients are added; as when we stir flour of mustard in the water of a common foot-bath, or add it to a cataplasm. Hot fomentations act upon the same principle in the relief of internal and deep-seated pains, of a neuropathic character especially.

13. FRICTIONS.

Frictions, when properly employed, are excellent revellents, producing, if employed for a sufficient length of time, redness of the surface. It is mainly by virtue of the friction that several of the liniments exert their beneficial agency in many morbid conditions. This is proved by the fact, that astonishing relief is afforded by dry rubbing. The use of the curry-comb, it is universally admitted, has an excellent effect on the nutrition of the horse; and the flesh-brush, or rubbing the whole of the surface of the body with gloves made of horse-hair or a coarse towel, has a no less beneficial agency in many morbid cases,—of torpor of the digestive function especially. Friction with the dry hand, executed for at least half an hour by the clock, is an excellent agent in many rheumatic and neuralgic affections; but it must be faithfully employed, and for a fixed period, to reap much benefit from it. When thus used, it has afforded marked relief in deep-seated pains, after liniments, rubbed in for a short time, had been used in vain. The only precaution necessary is for the rubber to dip his hand every now and then into wheaten flour or rye meal, which prevents abrasion either of the rubber or the rubbed.

14. DRY CUPPING.

Under the general observations on revellents, the derivative effect of local blood-letting by cupping was examined. This effect was considered to be induced by the compound action of the loss of blood from the divided capillaries, and the wounds made by the scarificator; and—it may be added—from the diminished atmospheric pressure on the part to which the cupping glass is applied. When dry cupping is employed, the last is the main revulsive influence exerted. Yet it is a very valuable one in many cases, and well adapted for the relief of local pains, especially in those persons who, from protracted indisposition, or other causes, are unable to bear cupping with the scarificator, or what are commonly called *cut cups*. An *air-pump bath* has been employed, in which the atmospheric pressure is diminished over a greater or less surface of the body; and the application of vapour has been associated

with this, constituting the *air-pump vapour bath*, which has been used in gout, rheumatism, and paralysis. *Hæmospasia*—as this mode of revulsion has been termed—was first urged some years ago by M. Junod, who twice received the Monthyon prize for his essays on the subject. It has been properly described as a means of producing a powerful *revulsion* of the blood from one part, and an equally powerful direction of it to another part of the body, by removing the atmospheric pressure from a large extent of surface,—as from one or both extremities at the same time. It is, in other words, dry cupping on a large scale. In 1835, M. Magendie highly extolled it in cases in which it is important to attract the blood from the internal parts towards the surface of the body, without causing any loss of the vital fluid; and its effects certainly entitle it to great attention. They resemble those produced by hæmostasis, which—as elsewhere remarked—detains the blood in the vessels of the surface, and thus acts, for the time, in the same manner as the withdrawal of a certain quantity of blood from the circulation. The face, under the hæmospastic treatment, is rendered pale; the pulse slower; at times, there is a tendency to syncope; and often much disturbance of the gastric and intestinal functions. In inflammatory diseases it may be employed under the same circumstances as hæmostasis; and in addition, in affections of internal organs, which require the use of an efficacious and powerfully revellent influence.

M. Junod's apparatus, is made of copper in the shape of a boot, and is applied as one, having an India rubber top to tie round the thigh, and render it air-tight. The air is then exhausted by means of a syringe. By the application of this apparatus, the leg may be distended to double its ordinary size; the pulse is at first quickened, but is gradually reduced both in frequency and strength, and even syncope may supervene. Very little pain attends the operation. After the removal of the apparatus, the blood gradually returns to its course; and in a couple of hours the swelling of the leg subsides. Experience has shown, that sixty operations on the same leg, with one or two days interval, may be attended with no injurious effects to the nervous system. Dr. Marsden described to the Provincial Medical and Surgical Association an establishment under the superintendence of M. Bonnard, of Paris, which was entirely devoted to the application of this instrument. He referred to the success which had attended its employment by M. Cerise, and detailed the histories of several cases in which he had himself witnessed beneficial results,—as in amaurosis, deafness, sore-throat, chlorosis, amenorrhœa, croup, phthisis, &c.—a somewhat heterogeneous assemblage! (*New Remedies*, 5th edit., p. 618, Phil., 1846.)

It need scarcely be said, that the diminished pressure induced over a considerable surface must necessarily have the effect of modifying the circulation of the blood, and inducing a new effect on the nervous system; and hence it may be an energetic revellent.

15. ACIDUM ACETICUM.—ACETIC ACID.

Strong acetic acid—described under *Escharotic Revellents*—is employed as a rubefacient. It may be diluted with an equal quantity of

water; and a piece of cotton, or blotting paper, dipped in it, may be left on the skin, until the effect is induced. In its concentrated state it may be applied in the same manner to cause vesication, and if kept on for a long time may disorganize the integument so as to induce sloughing. It has been used in cases of cramp, and other affections, in which it is esteemed advisable to induce sudden revulsion; but it is rarely had recourse to.

16. ACIDUM NITRICUM.—NITRIC ACID.

Nitric acid, (Vol. ii. p. 73,) rubbed on the skin, is capable of exciting rubefaction, where it is desirable to induce a speedy action on the cutaneous surface, as in malignant cholera. For this purpose it may be diluted with six or eight parts of water. In its concentrated state, it acts of course more violently; but it is not preferable, as a counter-irritant, to boiling water; whilst its destructive action on every organic substance with which it comes in contact makes it objectionable. It is rarely used as a rubefacient.

The Dublin College has UNGUENTUM ACIDI NITRICI, which is composed of *Olive oil* ℥j; *Lard* ℥iv; *Nitric acid* f.℥vss; which may be rubbed on the skin to excite rubefaction.

17. ACIDUM SULPHURICUM.—SULPHURIC ACID.

Sulphuric acid may be used like the nitric to produce a rubefacient action. The Dublin College has a formula for UNGUENTUM ACIDI SULPHURICI, which is composed of *Sulphuric acid* ℥j; *Lard* ℥j. It is used in the same cases as *Unguentum Acidi Nitrici*.

18. ACUPUNCTURE, ELECTROPUNCTURE, ELECTRICITY, GALVANISM, &c., considered under EXCITANTS, (Vol. i. p. 510, *et seq.*) act as revellemts. And the same may be said of

19. MAGNETISM. It has been affirmed by Baron Von Reichenbach, that magnets of ten pounds supporting power, when drawn along the body downwards, without contact, produce certain sensations in sensitive individuals. Occasionally, in twenty persons, three or four susceptible persons are found; and in one examination by Von Reichenbach of twenty-two females, eighteen were susceptible. The sensation is said to be rather unpleasant than agreeable, and is like an aura, in some cases warm; in others cool; or it may be a feeling of pricking, or of the creeping of insects over the skin. Persons affected with spasmodic diseases—epilepsy, catalepsy, chorea, paralysis and hysteria—are especially sensitive; and lunatics and somnambulists uniformly so.

Under such circumstances, the diseases for which magnetism would be suggested, are the “nervous and spasmodic;” and accordingly the report of the *Société royale de médecine* of Paris, in 1776, testified to its success in spasms, palpitations, convulsions, epilepsy, tremors, cramps, neuralgia, rheumatism, &c.; and MM. Andry and Thouret, were dis-

posed to infer, that the magnet exerts an incontestable magnetic action on the nervous system, to which, in part at least, its curative agency must be ascribed. M. Laënnec, too, by establishing a magnetic current through the diseased parts by means of several magnetized plates, frequently found the pain moderated in pulmonary neuralgia; the oppression diminished in nervous asthma; spasmodic hiccough suspended; and its utility exhibited in simple neuralgia of the heart, and in angina pectoris. In the last disease, the application of a small blister under the anterior plate appeared to render the effects of the magnet more marked.

The author has witnessed the application of the magnet repeatedly in nervous diseases in persons of highly impressible habits; but except in such, and apart from the effects of the imagination, he has seen no beneficial results from it. (*New Remedies*, 5th edit. p. 429, Philad. 1846.)

It is needless, therefore, to enter into a detail of the different modes of application.

b. *Vesicant Revellents.*

20. CANTHARIS.—SPANISH FLIES.

The employment of cantharides as a rubefacient revellent has already been described, (ii. 250). They are most commonly used, however, as vesicants: indeed, they are the only agents employed with this view by the mass of practitioners; and with the exception of cases in which the irritation produced by them is excessive, they are the best of the vesicants that require time for their operation.

The general properties of cantharides have been described elsewhere, (Vol. i. p. 281.) It was there mentioned, that their active property resides in a peculiar principle, *cantharidin*. This has been found, likewise, in *cantharis vittata*, and other vesicating insects. It is obtained by concentrating an alcoholic tincture of the flies, made by displacement, and setting it aside. The cantharidin crystallizes slowly. It is considered to be a solid volatile oil. It is not, of itself, soluble in water; but becomes so by combination with other constituents of cantharides. It is easily dissolved in ether; and in oils—fixed and volatile—as well as in hot alcohol. One hundredth part of a grain, placed on a slip of paper, and applied by M. Robiquet to the edge of the lower lip, caused small blisters in a quarter of an hour. Its action as a vesicant is exceedingly energetic.

Powdered cantharides yield their vesicating properties to boiling water, and more readily to acetic acid, alcohol, dilute alcohol, ether, and the fixed and volatile oils; all of which have, therefore, been used pharmaceutically, and most of them are employed at the present day in different official formulæ.

When applied to the cutaneous surface in a proper form, cantharides first induce rubefaction, as already shown, and then vesication. The length of time required to produce the latter effect varies in different individuals. The usual routine direction is to put on a blister at bed-

time, and to remove it the following morning. Where the skin, however, is thin, vesication will be induced in a much shorter time—in six or eight hours. The blister should then be removed, as a longer continuance may induce so much irritation in the derma as to give occasion to sloughing; or the cuticle may break, the effused fluid be discharged, and, owing to the vesicating substance coming in contact with the exposed derma, absorption of the cantharidin may occur endermically, and cause great nephritic and vesical distress. In children, it is extremely important to bear this in mind, as gangrene has supervened on the application of blisters, especially where erethism has existed in the dermoid tissue,—as in cases of measles, scarlatina, &c. A few hours—three or four at the farthest—are commonly enough to excite rubefaction, if not vesication; and if the former be fully developed when the blister is removed, the latter is pretty sure to succeed under the use of simple cerate. When the blistering plaster is taken off, the blisters should be opened by snipping them with a pair of scissors, and applying a dressing of simple cerate, or of oil and wax melted together. In the Southern states—the leaves of the common cabbage are used as a dressing. Of late, Dr. D. MacLagan, has recommended that blistered surfaces should be dressed with cotton wadding. After a blister has been removed, he applies for two hours a soft warm poultice of bread and milk. When the poultice has been removed, the vesication, if it has not burst spontaneously, must be cut, and a thick layer of soft cotton wadding be applied with the undressed or woolly surface next the skin. If, in the course of a few hours, this should become soaked with the serous discharge from the blister, so much of the cotton may be removed as can be done without disturbing the loose epidermis beneath, and the whole must be again covered with a dry layer of cotton. This is all the dressing that is in general required. The cotton is allowed to adhere to the skin of the blistered part, and when a fresh layer of epidermis is formed, the old epidermis and cotton come off together.

The advantage of this plan, Dr. MacLagan states to be:—*first*, that it renders the blister much less painful and annoying to the patient than when ointments are used. The tenderness in fact is comparatively so trifling, and the protection by the cotton so good, that he has been enabled, without annoyance to the patient, to percuss freely, and apply the stethoscope firmly over blistered parts, which had been dressed for the first time only an hour or two previously.—*Secondly*. The blisters heal faster under it than under dressings with cerate; for although the cotton may remain adhering for some days, he has generally found that within twelve hours the patient ceases to consider the blister a source of annoyance:—and *Lastly*. It dispenses with the greasy applications so disagreeable to patients of cleanly habits.

Generally, the blistered part heals in the course of a few days, but at times, suppuration follows. Occasionally, the skin is so little sensible, that blisters do not affect it, unless the surface has been first irritated by rubbing it with oil of turpentine, or by the application of a sinapism.

It has been before stated, that to prevent the absorption of cantha-
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ridin, and its irritating effects on the urinary organs, a piece of gauze or tissue paper should be placed over the blistering plaster, through which the vesicating property is sufficiently exerted. It is said, that by boiling the flies in water, their power of causing strangury is destroyed; whilst the vesicating property is unimpaired. When those effects have been induced, the best remedies are diluents and opiates. Owing to the liability to these painful accidents, especial caution should be used in the employment of blisters of cantharides in inflammatory affections of the urinary apparatus.

CERATUM CANTHARIDIS, CERATE OF SPANISH FLIES. (*Cantharid. pulv. subtiliss.* ꝥj; *Ceræ flavæ, Resin., Adipis* āā ʒvii.) This is *Emplastrum epispasticum*, *Blistering Plaster*, of the shops. When used, it is generally spread upon leather, a margin being left to prevent the plaster coming in contact with the clothes of the patient; or the margin is spread with *Emplastrum plumbi*, or *Emplastrum resinæ*, to cause it to adhere. In eleemosynary institutions, it is generally extended upon coarse paper. The use of sheepskin has been objected to by Mr. Wm. Procter, junr., of Philadelphia, and with propriety, as, owing to its porous character, it absorbs much of the vehicle, and sometimes leaves the surface of the plaster so dry, that its adherence and activity are prevented. The material should be soft and yielding, at the same time that it ought not to absorb the oil from the cerate; and, accordingly, oiled silk, which possesses all these requisites, has been proposed as a substitute for sheepskin.

When it is desired that the blister should heal speedily, it may be dressed with simple cerate, in the manner before mentioned. At times, however, the surface becomes exceedingly red and inflamed, and the margin is covered with an ecthymatous eruption: at others, a kind of diphtheritic exudation accompanies the vivid inflammation. In such cases, an emollient poultice may be demanded, with the ordinary treatment required in inflammation of the skin. When the surface remains red without any disposition to heal, dusting with hair powder, or with chalk, has sometimes a salutary effect; and if the granulations be too luxuriant, it may be necessary to touch the surface with sulphate of copper, and dress it with dry lint. Occasionally, it is considered desirable to keep the blister open, or to form what is called a "*perpetual blister*." This may be effected by dressing it with *Ceratum resinæ*, *Ceratum sabinæ*, or *Unguentum cantharidis*.

The Edinburgh College has *Emplastrum cantharidis compositum*, (*Tereb. Venet.* ʒivss; *Picis Burgund., Cantharid.* āā ʒiij; *Ceræ*, ʒj; *Cupri subacetat.* ʒss; *Sinap. alb., Piperis*, āā ʒij) which is said to be an infallible vesicant. It is an unnecessary polypharmaceutical addition to the list.

The London and Edinburgh Pharmacopœias have *Acetum cantharidis* or *Vinegar of cantharides*, (*Cantharid. pulv.* ʒij; *Acid. acetic.* Oj.—Pharm. Lond.) which resembles the chemical blistering fluid, recommended by Messrs. Pugh & Plews, of Edinburgh, several years ago. A piece of lint, wetted with this preparation, may be placed upon the part, and be covered by adhesive plaster. It is said to vesicate in the

course of three hours ; and not to induce strangury. It would appear, however, to be somewhat uncertain in its operation.

An ethereal extract of cantharides, melted with twice its weight of wax, and spread upon cloth or paper prepared with waxed plaster, has been employed as a blistering cloth, and substituted for ordinary blistering plaster. A *blistering paper* has likewise been made by spreading upon paper an ointment, composed of *white wax* 8 parts ; *spermaceti* 3 parts ; *olive oil* 4 parts ; *turpentine* 1 part ; *cantharides*, in powder, 1 part ; *water* 10 parts. This is boiled slowly and strained. (Henry and Guibourt.)

A solution of cantharidin in olive oil has been proposed as a substitute for ordinary blistering plaster,—paper being saturated with it ; but it is not much used.

CAN'THARIS VITTA'TA, *Potato flies*, (Vol. i. p. 283,) may be used as a substitute for CANTHARIS.

21. AMMO'NIÆ PRÆPARA'TA.—PREPARA'TIONS OF AMMO'NIA.

Enough has already been said of the use of these as vesicants, under the head of *Rubefacient Revellents*. (Vol. ii. p. 249.)

22. ARGEN'TI NITRAS.—NITRATE OF SILVER.

Nitrate of silver is most frequently employed as an escharotic ; but it is likewise used occasionally as a vesicant. With this view, the part is moistened, and the solid nitrate is passed lightly over it in a crucial direction, so that the whole of the moistened surface may be affected, and yet not to the extent of inducing ulceration. In three or four hours, the epidermis rises, the subjacent fluid being rather purulent than serous ; this may be discharged, and if any dressing be needed, it may be of *Ceratum simplex*. Dr. A. T. Thomson affirms, that he has found this mode of exciting vesication admirably adapted for pulmonary affections attended with much morbid excitement. Twenty of these blisters may be made over the surface of the thorax, in as many days, with the best effects. It is equally useful, he adds, in diseases of the joints, and deep-seated pains. "The only caution required is moderation in the application ; when too much of the nitrate is rubbed on the part, the pain is excruciating, and its influence on the vascular system is sufficient to counteract any benefit which might result from its contra-stimulant property."

It has been strongly recommended as an application in external inflammation ; applied, at times, so as merely to blacken the surface ; at others, so as to excite vesication ; and the new action thus induced in the vessels of the part—as elsewhere remarked of blisters, (Vol. i. p. 440,)—is sufficient at times to arrest erysipelas, and occasionally phlegmonous inflammation also. It is not uncommon to trace a line around the inflamed parts with stick nitrate of silver, with the view of circumscribing the inflammation ; and the artificial excitement of the capillaries, thus in-

duced, is at times effectual in limiting the disease; but it has often failed in the author's practice; as it has in that of others.

23. RANUNCULUS.—CROWFOOT.

Ranunculus—in the secondary list of the Pharmacopœia of the United States—is the cormus and herb of *Ranunculus bulbosus*, *Crowfoot*, *Buttercup*, *Yellow weed*; SEX. SYST. Polyandria Polygynia; NAT. ORD.

Fig. 160.



Ranunculus acris.

Ranunculaceæ; which is common in the pastures of the United States, flowering in May and June. All the ranunculi are possessed of an acrid principle, which passes over in distillation with water, and is lost by the process of drying.

Ranunculus, when bruised and applied to any part of the cutaneous surface, excites redness; and if kept on for any length of time, generally induces vesication; but it appears to be exceedingly uncertain in its operation; sometimes producing scarcely any effect; at others, causing ulceration and sloughing of the integument. It is, consequently, but little used.

24. SINA'PIS.—MUSTARD.

Enough has been said of the vesicating action of mustard, and its essential oil, under *Rubefacient Revellents*, (Vol. ii. p. 247,) to which the reader is referred.

25. CALOR'IC.

Vesication can be effected by the application of STEAM, OR BOILING WATER, OR HEATED METAL. Steam is very rarely used therapeutically, in consequence of the difficulty of restricting its action to a part of the surface; and the same applies,

to a great extent, to the application of boiling water. By the use of heated metal, this inconvenience can be avoided. The mode of applying it is by means of a piece of polished metal, dipped in boiling water, and applied to the part to be vesicated. These agents induce sudden revulsion, and are adapted for violent affections, such as spasm of the stomach, or severe neuralgic affections of any kind.

A plan, lately proposed for raising vesications on the surface, is very effective; and has been regarded as a form of moxa. It is attended with intense pain; but in severe cases this may be far from objectionable. A piece of linen or paper, cut of the requisite size, is immersed in spirit of wine or brandy. It is laid on the part to be blistered, care being taken that the moisture from the paper or linen does not wet the

surrounding surface. The flame of a lighted taper is then applied quickly over the surface, so as to produce a general ignition, which is exceedingly rapid. At the conclusion of this operation, the cuticle is found detached from the true skin beneath.

c. Suppurant Revellemts.

26. ANTIMONII ET POTASSÆ TARTRAS.—TARTRATE OF ANTIMONY AND POTASSA.

Tartrate of antimony and potassa, associated with lard and rubbed on the skin night and morning, inflames the derma and gives occasion to a crop of large pustules with inflamed bases. It is sometimes used in the form of solution, which is rubbed on the part; and in other cases, from ten grains to a drachm in fine powder are sprinkled over a Burgundy pitch plaster. The effect is the same from these different forms of application. When the pustules have once appeared, it should be discontinued, for fear that troublesome ulcerations may ensue. Tartrate of antimony and potassa, in the form of ointment, has been used, likewise, to keep issues open; but caution is here again required, lest extensive ulceration or sloughing should be induced. In the last case, too, danger is incurred of absorption of the salt, which sometimes follows the other modes of employing it; but such absorption is rare.

Pustules produced by the ointment of tartrate of antimony and potassa are generally exceedingly painful; but they are well adapted for establishing effective counter-irritation in chronic pulmonary, and other internal diseases. It is well to bear in mind, that the large pustules are often succeeded by white scars, so that the salt should not be applied to parts of the surface that are apt to be exposed.

UNGUENTUM ANTIMONII, ANTIMONIAL OINTMENT. (*Antim. et Potass. Tartrat. in pulv. subtiliss. ʒij; Adipis ʒj.*) A portion of this ointment of the size of a hazelnut, may be rubbed on the skin night and morning: in the course of a day or two, the part generally becomes painful, and a crop of pustules appears: the rubbing may then be discontinued, and a fresh portion of skin be selected; so that, in this way, a succession of irritations may be maintained. The facility with which the eruption can be produced depends upon the thickness and impressibility of the skin: at times, the author has found the advent of the pustules hastened by the previous application of a sinapism. The ointment should not be applied over an abraded or cut surface. Instances have been related in which severe and even fatal constitutional disorder has appeared to result from the use of antimonial ointment; but the author has never met with a serious case. In two or three persons, it has excited vomiting.

Tartrate of antimony and potassa may likewise—as remarked above—be used in the form of lotion, in the proportion of one drachm of the tartrate to a fluidounce of boiling water, rubbed together in a mortar.

It is often employed in pulmonary affections, rubbed on the chest night and morning. Dr. Hannay adds five grains of corrosive chloride of mercury, by which, he says, the power and efficacy of the lotion are quickened.

27. IPECACUAN'HA.

A counter-irritant of powdered Ipecacuanha has been recommended by Dr. Hannay, which, he says, was first suggested to him by his colleague, Dr. Easton, Professor of Materia Medica in Anderson's University, Glasgow. It is composed of *Ipecacuanha powder*, and *olive oil*, of each two drachms; *lard*, half an ounce. The part is to be rubbed freely with this liniment for fifteen or twenty minutes, three or four times daily; and to be enveloped in flannel. In about 36 hours, or sometimes sooner, very numerous small papulæ and vesicles appear, seated on a deep red base of irregular extent. These soon become flattened and assume the pustular character. They never ulcerate like pustules produced by tartrate of antimony and potassa, than which ipecacuanha is much less severe; but not less efficacious.

The author has never employed this counter-irritant, and notwithstanding the encomiums of Dr. Hannay the experience of others does not encourage him. Dr. Cormack detailed to the Medico-Chirurgical Society of Edinburgh, the result of his hospital observations with it in the form advised by Dr. Hannay. In ten out of twelve cases, it failed to produce any eruption, even when the powder was in the proportion of half an ounce to an ounce of lard. In a few persons only, who had delicate skins, or had had recent blisters on the surface experimented on, he succeeded in bringing out an eruption, which was vesicular in three carefully observed instances. In the persons on whose skin the ointment of ipecacuanha produced no effect, a good crop of pustules was, in every case, brought out by one, two or three frictions with a liniment of equal parts of olive and croton oil. Dr. Cormack expressed the belief, that there are many vegetable powders, which would be found more active counter-irritants than ipecacuanha.

The experience of Dr. Cormack was corroborated by that of other physicians, who were present at the meeting of the society. The author has never used it.

28. O'LEUM TIG'LII.—CROTON OIL.

Croton oil—whose general properties have been described under *Cathartics*, (Vol. i. p. 204,)—rubbed upon the skin, excites redness, followed by an eruption of pustules, provided the friction be long continued, or often repeated. These pustules, when numerous, become confluent, and around the place where the confluent eruption is seated, pimples appear over a wider extent, which become transformed into pustules, and are surrounded by a red base or areola. When the pustules are discrete, they dry up more rapidly; and when confluent usually form scabs. As in the case of antimonial ointment, the pustulation is sooner induced where the skin is thin. Commonly, the eruption is

perceptible within twelve hours after the first friction, if it has been continued for some minutes; and it usually disappears in the course of from three to six days. It is never so painful as that caused by anti-monial ointment.

Frictions with the oil are adapted for cases in which counter-irritants, that require time to induce their action, are indicated. It has been much used in chronic internal inflammations, in gouty and rheumatic affections, aphonia, chronic hoarseness, phthisis, asthma, and whooping-cough; and has been regarded as especially effective in rheumatic odontalgia and otalgia.

When applied with the view of exciting an eruption,—from four to six drops, or even more, may be rubbed in twice a day. Generally, a mixture of equal parts of the oil and olive oil is sufficiently powerful. If the skin be thick, it may be well to rub it first with a coarse towel, or to apply a sinapism. Where the skin is excitable, it may be mixed with from one to five parts of olive oil, oil of turpentine, soap liniment, or lard. An ointment of a still feebler kind is sometimes used for the same purpose. (*Ol. Tiglii*, $\text{℞}—\text{xxx}$; *Adipis* ℥ss .) This is adapted for the delicate skins of children.

M. Bouchardat has recommended the following plaster of croton oil. Melt eighty parts of *diachylon plaster* at a very gentle fire, and when semiliquid mix with it twenty parts of *croton oil*. The resulting plaster is to be spread thickly on muslin. It is capable of producing considerable irritation of the skin; and may be employed in all cases where revellents are required. It does not occasion such severe pain as many other counter-irritants; and, according to M. Bouchardat, it will be found available in the treatment of many chronic diseases of the thoracic and abdominal viscera.

29. AC/IDA MINERALIA.—MINERAL ACIDS.

Mineral acids—especially SULPHURIC and NITRIC—when combined with a greater quantity of lard than that mentioned under the head of *Rubefacient Revellents*, (Vol. ii. p. 255,) and rubbed for some time on any part of the cutaneous surface, give occasion to the formation of pustules, which may be the means of deriving from inflammatory and other irritation in internal organs. They are not, however, much employed with this object.

30. ISSUES AND SETONS.

Issues—*Fonticuli*—may be made with any actual cauterant, or with any of the potential cauterants described hereafter. The most common agent is potassa; and, when the slough has separated, either the Curaçoa orange—*Aurantium Curassaventium*—or a common dried pea, is introduced, and kept in its place by diachylon or some form of adhesive issue plaster. Occasionally, to keep them discharging, it becomes necessary to apply one of the suppurant ointments already described.

The seton—*Setaceum*—is established by pinching up the common integument of the part with the finger and thumb of the left hand; and

passing through it a seton needle, armed with a skein of silk ; or an ordinary tape, or a caoutchouc tape, or a strip of sheet lead may be used for the same purpose. The position of these must be changed daily, and it may be necessary to smear them, from time to time, with some excitant ointment.

Issues and setons are valuable counter-irritants ; and, as already remarked, their good effects are not dependent upon the discharge, but upon revulsion. At the same time they are uncleanly and disagreeable ; require much attention ; and are consequently by no means as often employed as they were formerly. It is difficult to induce patients to repeat the application of other counter-irritants as often as may be desirable ; and, therefore, the practitioner has recourse to permanent revellents of this kind. The system, however, gradually becomes accustomed to them, so that they, in some measure, lose their effect ; and by long continuance, become so much a part of the natural actions, that they cannot be suddenly arrested with impunity. When old ulcers heal, a source of irritation is apt to occur elsewhere ; and it becomes advisable to insert a seton, or to establish an issue in the vicinity. For head affections, the seton is usually placed in the nape of the neck ; for phthisical cases in the side. It is a popular preference to establish an issue in the arm for ophthalmia. In spinal affections it is generally made on each side of the vertebral column.

Dr. Golding Bird has recently proposed what he calls an *Electric Moxa*, founded upon the long observed fact, that when a simple galvanic arc is applied to a blistered surface, the part opposed to the most oxidizable metal is more irritated than that to which the negative plate is applied. In adapting such a simple arc to the treatment of paralysis, he was struck with the remarkable effects produced. The following he proposes as a ready mode of establishing a discharge from the surface of the body. Order two small blisters, the size of a shilling, to be applied to any part of the body—one a few inches below the other ; when the cuticle is thus raised by effused serum, snip it, and apply to the one, whence a permanent discharge is required, a piece of zinc foil, and to the other a piece of silver ; connect them by a copper wire, and cover them with a common water dressing and oiled silk. If the zinc plate be raised in a few hours, the surface of the skin will look white, as if rubbed over with nitrate of silver. In forty-eight hours, a decided eschar will appear which, if the plates be still kept on, will begin to separate at the edges in four or five days. The plates may then be removed, and the surface where the silver was applied will be found completely healed. A common poultice may be applied to the part, and a healthy granulating sore, with well defined edges, freely discharging pus, will remain.

31. CAN'THARIS.—SPANISH FLIES.

Cantharides are employed in the form of ointment to keep blisters open, and to excite suppuration.

UNGUENTUM CANTHARIDIS, OINTMENT OF SPANISH FLIES. (*Cantharid. pulv.* ℥ij; *Aquæ destillat. Oss*; *Cerat. resin.* ℥viii.) The Spanish flies are boiled in the water and strained; the cerate is then mixed, and the whole is properly evaporated. Boiling the flies in water does not destroy their peculiar powers; but it has been considered by some that it renders their active principle less liable to be absorbed. Spread on lint, this ointment is a very common and good application to blistered surfaces to induce suppuration; and to issues to keep them open; and it may be used in cases of atonic ulcers to excite in them a new action.

32. SABINA.—SAVINE.

Savine—whose irritant qualities have been referred to elsewhere, (Vol. i. p. 419,)—is frequently employed as a suppurant to form perpetual blisters. With this view, it is made into a cerate, which in Europe, is formed of the fresh leaves; and is, therefore, more active; but even there it is complained of for its uncertainty;—perhaps, as suggested by Dr. Christison, owing to a part of the volatile oil—the active constituent—being driven off by the high heat directed in preparing it. In this country, savine cerate is prepared according to the following formula, from the drug as imported.

CERATUM SABINÆ, SAVINE CERATE. (*Sabin. pulv.* ℥ij; *Cerat. resin.* ℥ij.) This cerate is to be preferred to *Unguentum Cantharidis* for one reason,—that there is no risk of strangury from absorption of acrid matter. It is occasionally applied to the threads or tapes of setons, and to issues to increase the discharge.

An ointment is sometimes prepared from *Juniperus sabina*, *American savin*, which is used for the same purpose.

33. MEZEREUM.—MEZEREON.

Mezereon—whose general properties are described in the first volume, (p. 321,)—is a local irritant and vesicant. The fresh bark is more active; but the dried possesses the virtues. Both that of *Daphne mezereum* and of *Daphne gnidium*, or *garou*, is employed. It may be soaked in hot vinegar and water, and be applied to the part by a compress and bandage. The application must be renewed night and morning, until it occasions vesication; which generally requires from twenty-four to forty-eight hours.

UNGUENTUM MEZE'REI, OINTMENT OF MEZEREON. (*Mezerei concis.* ℥iv; *Adipis* ℥xiv; *Ceræ albæ* ℥ij.) The mezereon is digested with the lard in a salt-water bath, according to the directions in the Pharmacopœia. To the strained lard, the wax is added; and an ointment formed.) This ointment may be used to keep blisters and issues open. It has been introduced into the last edition of the Pharmacopœia of the United States.

An ointment has likewise been made of the alcoholic extract of mezereon, which is employed for the same purposes.

d. *Escharotic Revellents.*1. *Erodents.*

34. ARGENT'I NITRAS.—NITRATE OF SILVER.

As an erodent, nitrate of silver is applied, in the solid state, to fungous growths, warts, corns, &c., that possess feeble vitality; and are, therefore, readily destroyed. When first brought in contact with luxuriant growths or an ulcer, it produces a white film, which is owing to the combination of the nitrate with the albumen of the surface of the ulcer; and probably also with chloride of sodium in the secretions. This constitutes a slough, which gradually becomes dark, and is ultimately thrown off,—a new action having often been induced in the sound parts beneath the slough, so that, on its separating, the ulcer is sometimes found to be healed. With the view of changing the condition of the diseased surface, and destroying the morbid state, it is not unfrequently applied to chancres. It is likewise found to be very beneficial in fissured or excoriated nipples; and in certain chronic cutaneous affections.

Dissolved in distilled water, in the proportion of from gr. 40 to gr. 60 of the nitrate to a fluidounce of water, it is applied, by means of a camel's hair pencil, in the same cases.

35. CUPRI SULPHAS.—SULPHATE OF COPPER.

Sulphate of copper—elsewhere described (Vol. i. p. 122)—commonly known under the name *blue stone*—is frequently used as an erodent to destroy fungous growths in ulcers. It is applied either by touching the surface of the *proud flesh* with the solid sulphate; or the powder is sprinkled upon them; or they are washed with a strong solution of it. It appears to enter into combination with some of the constituents of the tissues with which it is placed in contact. It would seem, however, to occasion but little decomposition of the part; and can scarcely—Dr. Christison thinks—be regarded as a corrosive. It is, doubtless, a powerful excitant, and induces a new action in ulcerated parts so as to give occasion, in many cases, to their cicatrization. When applied in solution, the proportion may be gr. ij to gr. viij of the salt to a fluidounce of water.

The powder is sometimes rubbed on warts, simple or syphilitic; and a strong solution may be used for the same purpose.

36. CUPRI SUBACETAS.—SUBACETATE OF COPPER.

Subacetate of copper, *Ærugo*, *Verdigris*, whose general properties have been described elsewhere, (Vol. ii. p. 71,) is not unfrequently employed as an erodent in cases of warts and fungous growths, and as a detergent to foul ulcers. It may be sprinkled, in powder, over the surface of the ulcer; and when mixed with savine powder is occasionally rubbed over venereal and other warts. It is occasionally used

in certain chronic cutaneous affections; and has proved highly serviceable in ringworm of the scalp.

UNGUENTUM CUPRI SUBACETATIS, OINTMENT OF SUBACETATE OF COPPER. (*Cupri subacetat.* in pulv. subtiliss. ʒj; *Unguent. simpl.* ʒxv.) This may be employed in the cases above described. When reduced with lard, it is applied in ophthalmia tarsi,—at bedtime especially,—with the aid of a camel's hair pencil.

37. ALU'MEN EXSICCA'TUM.—DRIED ALUM.

Dried alum is alum melted in an earthen or iron vessel over the fire, the heat being continued until it becomes dry. The alum is then rubbed into powder.

It is chiefly used, as an erodent, to destroy exuberant granulations on ulcers; for which purpose, it may be sprinkled over the surface. It acts, also, as an excitant to indolent ulcers.

38. AC'IDA MINERA'LIA.—MIN'ERAL ACIDS.

SULPHURIC, NITRIC and MURIATIC acids, pure, or diluted with water, are used as erodents, chiefly in cases of warts and corns; and the same may be said of

39. AC'IDUM ACE'TICUM.—ACE'TIC ACID.

This is formed, according to the process introduced into the last edition of the Pharmacopœia of the United States, by decomposing *acetate of soda* by means of *sulphuric acid*, and distilling until the residuum becomes dry. The resulting acetic acid is mixed with *red oxide of lead*, and again distilled to dryness to remove the sulphurous acid, which has passed over in the first distillation. This acid has a specific gravity of 1.06; and 100 grains of it saturate 83.5 grains of crystallized bicarbonate of potassa. Acetic acid or *radical vinegar*, thus obtained, is a colourless volatile liquid; having a pungent smell, and a strongly acid and corrosive taste.

40. SABI'NA.—SAVINE.

It has been just remarked, that savine powder is added to powdered subacetate of copper, to form an efficacious agent for the removal of syphilitic warts; and that the cerate is used as an irritant to maintain a discharge from ulcerated surfaces. A strong infusion is likewise employed in cases of warts and indolent ulcers; and, in certain chronic cutaneous diseases—as scabies, and porrigo favosa. The expressed juice of the plant, diluted with water, has been applied in the same cases.

41. SAC'CHARUM.—SUGAR.

Refined sugar (Vol. i. p. 246,) in powder, is sometimes sprinkled

over the surface of ulcers of which the granulations are exuberant; is blown into the eye, in specks of the cornea; and into the throat in diphtheritis. It is probable, however, that it acts in these cases merely as an excitant; modifying the condition of nutrition of the parts beneath, and thus removing the morbid state. It is in this way, doubtless, that specks of the cornea are taken away,—not by any corrosive action of the sugar.

2. *Actual Cauterants.*

42. CALOR'IC.

The application of free caloric in a certain degree of intensity to the surface of the body is a valuable revulsive agency. As an actual cauterant, it is employed to produce disorganization of the part with which it is made to come in contact; and thus either to excite a new action in the morbid structures beneath the slough formed; or to constitute centres of irritation, which may act as revellents in diseased actions going on elsewhere. Actual cauterants are much more powerful disturbing agents, than the potential, which induce disorganization by slow combination with the elements of the tissues. The natural dread of fire, however, prevents their use in this country to the extent that might be desirable; and, therefore, the potential,—the apparently less formidable, and certainly less efficacious,—are made to take their place.

There are two forms of actual cauterants which are used in practice;—hot iron and *moxa*.

1. HOT IRON.

A difference of action exists according to the degree to which the temperature of the metal is carried. When the cautery is at a red heat, unless it be applied for a longer period, it does not so rapidly and completely destroy the tissues as when heated to whiteness. The latter temperature is, therefore, chosen. Nor is it as painful an application as might be imagined. If the surrounding parts be well protected, so that they are not burnt by radiant heat, the death of the part takes place instantaneously; and but very little feeling is experienced,—certainly far less than is caused by any form of the potential cautery, which destroys by slow degrees. In using the white hot iron, therefore, it is advisable to protect the surrounding parts by having pieces of thick paper wetted and applied layer upon layer, with a hole in the centre, of the size that is desired, so that the cautery can be brought in contact with a circumscribed surface. This should be done quickly, inasmuch as the chief pain is occasioned by the approach of the heated metal to the skin.

The application of hot iron is a powerful counter-irritant, and of great value in many internal diseases. It is rarely, however, employed in such cases; but is in use, especially in France, for destroying malignant growths. It was considered, in antiquity, as the last resource,—a disease which fire could not cure being deemed incurable.

2. MOXA.

The term *moxa* is applied by the Chinese and Japanese to a cottony substance, prepared by beating the dried leaves of *Artemisia Chinensis*, or, according to Lindley, of *A. Moxa*. With the down they form a cone, which is placed upon the part to be cauterised; and set fire to at the top. This mode of cauterisation has been long practised by those people, and by the ruder nations of the old world; but it was not much employed in Great Britain and France, until about the commencement of the seventeenth century, when Ten Rhyne—a Dutch practitioner—introduced it from India. It fell, however, into disuse, until it was revived during the last century; since which time it has been much used, especially by some of the French army surgeons. In other works, the author has referred to the various combustible substances employed by different nations in “moxibustion.”

In modern times, various substances have been used for the fabrication of moxas. In Germany, they employ the tinder—*amadou*—which is agaric prepared for the purpose; and it is not uncommonly employed in our hospitals,—a small disc or cylinder being placed on the part, and set fire to. It is now generally adopted in the French hospitals. The match, used by artilleryists, was recommended by Baron Percy, after Bontius. It is composed of hemp, steeped in a solution of nitrate of potassa. He likewise proposed the pith of *helianthus annuus*, recommending that the stalk should be cut into cylinders of the desired length, the bark being left on, so that, when ignited, and held in the hand, they may burn in the centre. *Percy's moxas*, prepared by M. Robinet, are said to be found in the London shops. They consist of pith, rolled in cotton, and enveloped in muslin. (Pereira.) That used by Baron Larrey, and very generally employed by many practitioners, is made by taking a quantity of cotton wool, pressing it somewhat closely together, and rolling it over a piece of fine linen which is fastened at the side by a few stitches. He advises, that it should have the shape of a truncated cone—the form usually adopted—and be about an inch long. It is generally, however, made shorter, and smaller than this. The *moxa* may be held in its place by means of two long hair-pins or wires, which are slightly bent so as to accommodate them to the shape of the *moxa*, by which it is retained in its proper position. For the same purpose, Baron Larrey employed a *porte-moxa*, consisting of a ring to receive the *moxa*, with a handle attached to it, and three small knobs or supports of ebony, placed beneath the ring to prevent the heated metal from acting on the skin.

Professor Gräfe, of Berlin, employed wafers, dipped in a mixture of three parts of *oil of turpentine* and one part of *sulphuric ether*. Before applying this inflammable matter to the skin, it is necessary to remove carefully from the wafer the superfluous liquid. These moxas are said to ignite readily, burn promptly and uniformly, and do not crepitate. Phosphorus has been recommended in the place of *moxa*, as more convenient and safe.

Of late, the following *moxa* has been recommended. Macerate

strips of coarse cotton or muslin in a saturated solution of bichromate of potassa, and when nearly dry, roll them tightly on a piece of wire of the twentieth of an inch in thickness, until the cylinder shall be about three-fourths of an inch in diameter, or as thick as may be thought desirable. The roll must then be wrapped round very tightly with strong thread, and covered with a piece of fine muslin stitched over it. The wire may then be withdrawn, and the cylinder completely dried. When wanted for use, a small piece of the requisite length may be cut off by a sharp knife and be fixed on the part by a piece of adhesive plaster having a cross cut in the centre. This moxa burns with a more uniform and steady ignition than those prepared with nitre.

To prevent the surrounding parts from being burnt, a wet rag may be placed on the skin, having a hole in it large enough to receive the moxa.

In the application of most of the moxas, their effects can be so graduated as to produce simple rubefaction, or vesication, or the formation of an eschar. Where a rubefacient action is alone desired, the cylinder may be removed, when the pain becomes somewhat severe; or the material in ignition may be held close to the surface, and be moved gradually along it. In this way, a counter-irritant effect may be exerted along the spine or any extensive surface. Any burning substance—a lighted coal, for example—will answer for this purpose. When it is desired to induce vesication, the moxa must be kept on longer; and if it be required to produce an eschar, it may have to remain on until it is wholly consumed. Baron Larrey, indeed, advises that the blowpipe should be occasionally employed to hasten its combustion. When the integument has once become disorganized, the slough will be thrown off in due time, leaving an ulcer. Baron Larrey says, that the sloughing can be prevented by the application of liquid ammonia to the burnt surface, after the moxa has been removed. This will do, when the disorganization is partial; but the author knows from experience, that when such is not the case it will often fail.

3. *Potential Cauterants.*

43. POTASSA:

Potassa, Caustic potassa, Hydrate of potassa, Pure kali, Lapis infernalis, strongest common caustic, is prepared by evaporating liquor potassæ till ebullition ceases, and the potassa melts. It is then run into moulds; and, when cold, is kept in well-stopped bottles. As met with in the shops, it is either in fragments of plates, or in pencils of a gray or green colour. It is very deliquescent; and greedily attracts carbonic acid from the air. It is very soluble in water, dissolving in less than its weight; and, unlike carbonate and bicarbonate of potassa, is soluble, also, in alcohol. It always contains various impurities, but they do not interfere with its medicinal action.

Caustic potassa is a powerful destroyer of organized tissues, combining rapidly with fibrin and albumen, and corroding and destroying the cuticle so as to give occasion to a saponaceous feeling, when rubbed

between the fingers. It is the most common caustic application for forming issues; although its extreme deliquescence is an objection to it. To obviate this, layers of adhesive plaster should be placed on the skin, with a hole of the proper size cut in their centre; and on the exposed skin, the extremity of a piece of potassa must be rubbed until the skin is discoloured. The part may then be washed with water or with vinegar; and a bread and milk or a flaxseed poultice be applied. In a few days, the eschar will be detached, after which the ulcer may be kept open by the issue pea and plaster; or by any of the suppurant ointments already referred to. Like nitrate of silver, it has been applied to poisoned wounds; and, inserted at the extremity of an appropriate bougie, to strictures of the urethra. Mr. Whately affirmed, that this application might be employed with entire impunity; but the apprehensions of practitioners, owing to its great deliquescence, have prevented them from adopting it extensively; and it is now rarely used.

A solution of *potassa* ʒiiss, in *distilled water* f.ʒij, has been recommended by Dr. Hartshorne, of Philadelphia, to be drawn quickly along the spine, by means of a sponge attached to the end of a stick, in tetanus. It acts as a powerful rubefacient.

POTASSA CUM CALCE, POTASSA WITH LIME, is in the London and Edinburgh Pharmacopœias. It is formed by the union of equal parts of *Potassa* and *Quicklime*; which are rubbed together, and kept in a well-stopped vessel. This is the *milder common caustic*; yet although so called, it is a powerful potential cauterant. It is not wholly soluble in water, unless the water be in very large proportion; and is only partly soluble in alcohol. It is employed for the same purposes as potassa. It is usually made into a paste with alcohol, and applied to the part to be cauterized. It is slower in its operation, and less deliquescent than potassa, and therefore less liable to spread beyond the part to which it is applied.

44. ZINCI CHLORIDUM.—CHLORIDE OF ZINC.

Chloride or *Butter of Zinc*, whose general properties are described under TONICS (Vol ii. p. 66,) has been recommended as a caustic, that does not exert any disagreeable influence on the organism. It has been used by Hancke and others to form issues, which it does in from six to eight hours; and has only been considered superior to many other caustics, where the destruction of a considerable thickness of structure is required, or where the removal of an excrescence in this manner is preferred by the patient to the knife. Nitrate of silver has been considered superior in promoting a sound action, when the unhealthy surface or stratum of the ulcer is superficial. Chloride of zinc has been used successfully for the destruction of *nævi materni*, and lupus, and in cancerous and malignant growths and ulcerations; and has been largely employed in this country. It is, indeed, an excellent cauterant.

Chloride of zinc may be applied as a caustic by means of a camel's hair pencil, either alone, or mixed with an equal portion of oxide of

zinc, sulphate of lime, or wheaten flour. To give it the proper consistence, from twenty-four to thirty drops of water may be added to each ounce of the chloride. It seems to act not only chemically, by destroying the part with which it comes in contact, but dynamically on the neighbouring living tissues,—as the appearance of the parts beneath is generally greatly improved after the separation of the eschar.

In the strength of two grains to the fluidounce of distilled water, it has been applied two or three times a day on lint to atonic ulcers; and when reduced by solution in water or wine, or mixed with oil or lard, has been used in paralysis as a rubefacient.

45. ARGENTI NITRAS.—NITRATE OF SILVER.

Of the uses of nitrate of silver as an erodent, mention has already been made. As a cauterant, it has been employed to cut short the progress of variolous pustules, and to prevent pitting; with which view, it is used on the first or second day of the eruption; the solid nitrate being applied to each pustule, after their tops have been removed. It has occasionally been used in the same manner in cases of herpes zoster.

In strictures of the urethra and œsophagus, the nitrate is put into the extremity of a bougie, and passed down to the seat of the obstruction; and in the former affection, it has often entirely succeeded,—not apparently by destroying the stricture, but by inducing some change in the vital actions of the part, which is followed by relaxation of the narrowed portion of the canal, “but which change is as difficult to explain as is the subduction of external inflammatory action by the application of this salt.” (Pereira.)

By rubbing the solid nitrate, moistened, over a portion of the cutaneous surface for some time, the vitality of the integument may become so much impaired, that an eschar may be caused, which, when it sloughs off, forms an issue; but it is rarely used for this purpose. It is an excellent application, however, in phagedenic ulcerations of all kinds, gangrenous stomatitis, &c., in which it is necessary to destroy the surface, and induce a new action in the parts beneath.

46. ANTIMONII MURIAS.—MURIATE OF ANTIMONY.

Muriate or Sesquichloride, Hydrochlorate or Chlorohydrate of Antimony, Oil or Butter of antimony, as met with in the shops, is usually prepared by dissolving roasted *sesquisulphuret of antimony* in *chlorohydric acid*. It may also be made by dissolving crude antimony in the same acid. It is a transparent liquid, the colour of which—dependent on the iron it contains—varies from yellow to deep red. When applied to a wounded surface, it acts as a powerful caustic, forming an eschar without any excessive pain; hence, it is sometimes used in cases of poisoned wounds, and as a caustic to sloughing ulcers. It is not much employed, however, and is not admitted into the Pharmacopœias of Great Britain, or into that of this country.

47. AC'IDA MINERALIA.—MINERAL ACIDS.

The mineral acids are sometimes employed as caustics, especially

AC'IDUM NI'TRICUM, *Nitric Acid*. This is not used, however, to form issues; but is applied not only to destroy warts, but to disorganize the surface of foul phagedenic ulcers; and as a caustic to the bites of rabid animals or venomous serpents. With this view, it is applied undiluted, and is kept *in situ*, by smearing the surrounding parts with some resinous ointment. An eschar is in this manner formed, which falls off; and the base of the ulcer is often found to have assumed a new action. It may be applied by means of a piece of sponge or linen rag tied around a small piece of stick. Sometimes it may be necessary to cut through the slough, so as to make the acid reach the living tissues beneath. In the strength of about f.ʒj of *acid* to Oj of *water*, it is a good application to foul ulcers; and when still farther diluted—m̄xij to water Oj it is an excellent stimulant to atonic ulcers. Dr. Houston, of Dublin, has recommended the strong acid as an application to the "internal bleeding pile," "that soft, red, strawberry-like elevation of the mucous membrane," for which he uses the term, "vascular tumour." The acid of specific gravity 1.500, he has found of eminent service,—combining—he affirms—all the advantages possessed by excision and ligature, without any of their disadvantages. He directs the application to be made in the following manner. Let the patient strain as on the night-chair, so as to bring the tumours fully into view; and whilst they are so down, let him either lean over the back of a chair, or lie down in the bent posture on the side on which the disease exists, with the nates over the edge of the bed. Let a piece of wood, cut into the shape of a dressing-case spatula, be dipped in the acid, and then, with as much of the acid adhering to it as it will carry without dripping, let it be rubbed on the tumour to the desired extent. The due effect of the acid on the part is shown by its becoming of a grayish white colour. If a superficial slough be all that is required, a single application may be enough; if a more deep one, two or three applications; and if a still more deep one, two or three applications of the wood dipped in the acid may be made in quick succession, and these being finished, the part must be well smeared over with olive oil. The prolapsed parts must then be pushed back within the sphincter, the patient be put to bed, and an opiate administered. The pain is sharp and burning at first, but goes off in two or three hours. In no case has Dr. Houston heard of serious consequences from the remedy, and the symptoms usually following its application are so mild as not to absolutely require confinement to bed more than a few hours.

The safety and efficacy of this practice have been testified to by Mr. Cusack, of Dublin.

UNGUENTUM ACIDI NITRICI of the Dublin Pharmacopœia, (*Ol. Oliv. ℥j; Adipis ʒiv; Acid. Nitric f.ʒvss;*) is used in various skin diseases—for example, in scabies, porrigo, &c., and occasionally as a dressing

to syphilitic and other obstinate ulcers, in which it is advisable to induce a new action.

SULPHURIC and MURIATIC ACIDS are employed in the same manner; and for similar purposes.

48. ACIDUM CHROMICUM.—CHROMIC ACID.

Chromic acid, peroxide of chromium, is formed by adding a cold saturated solution of bichromate of potassa to concentrated oil of vitriol. On cooling, the chromic acid crystallizes in brilliant crimson prisms. It is very deliquescent, and dissolves in water and alcohol.

It yields its oxygen readily to organic substances, becoming reduced to the state of green sesquioxide. Its action on the living surface is that of a chemical irritant, and it has been recommended by Mr. A. Ure as an escharotic. It is, he says, always convenient of application, as it consists of a thick crystalline pap, which, when rightly managed, does not spread beyond the prescribed limits, and its erodent operation terminates with its passing into the state of inert pulverulent sesquioxide. In a case of external hemorrhoids, the acid was applied twice at an interval of two days. It caused acute burning pain at both times; destruction, to a considerable extent, of the diseased texture; consolidation of the remainder, and permanent relief.

49. ACIDUM ARSENIOSUM.—ARSENIOUS ACID.

Arsenious acid—whose properties have been described elsewhere, (Vol. ii. p. 86,) is a powerful caustic; and was at one time much used by surgeons in cases of cancerous and other morbid conditions in which it was advisable to destroy the parts. It was the basis, too, of several applications to cancers of a secret character—as the powder of Frère Cosme; and one of a Dr. Hugh Martin, of this country—the *Pâte de Rousselot*, Plunkett's paste, Febure's wash, &c., &c. When appropriately applied, it causes the death of the part; and, on the separation of the slough, a healthier action of the parts beneath is sometimes induced. Its precise chemical influence on the tissues does not appear to be known. It would seem, however, important, that the caustic should be so strong as to completely disorganize; otherwise the poison is apt to be absorbed. Cases, indeed, are recorded, in which it has proved fatal in this manner; and it has not even been applied in all cases with impunity, when the skin was whole. On these accounts the arsenical caustic is but rarely prescribed in cancer, lupus, onychia maligna, and the other affections in which it was at one time much used by surgeons. Absorption is thought to have occurred most frequently from bleeding surfaces.

The former Pharmacopœias of the United States had CERATUM ARSENICI, composed of *Arsenious acid*, in very fine powder, a scruple; *simple cerate*, an ounce; which was sometimes used as a dressing to cancerous ulcers. It has been dismissed in the last edition.

According to Mr. Carmichael, ARSENIATE OF IRON acts more powerfully on the vitality of cancerous formations than any other agent. Of late, he has employed a compound of this salt and *phosphate of iron*,—half a drachm of the former to two drachms of the latter, and six drachms of *lard*. This is applied by means of a camel's hair pencil; but not over the whole surface of the ulcer when extensive; or it may be applied spread on lint.

IODIDE OF ARSENIC has been used with advantage in the form of ointment, (*Arsenic. iodid.* gr. iij; *Adipis* 3j;) in cases of phagedenic tuberculous lupus.

50. HYDRAR'GYRI CHLO'RIDUM CORROSI'VUM; 51. HYDRAR'GYRI IOD'IDUM RUBRUM; and 52, HYDRAR'GYRI OX'IDUM RUBRUM, are occasionally used as caustics to malignant growths and ulcers; but their application in this manner will be referred to under another head. (SEE EUTROPHICS.)

53, HYDRAR'GYRI NITRAS AC''IDUS.—ACID NITRATE OF MERCURY.—*Liquor Hydrargyri supernitratis*, *Solution of supernitrate of mercury*, *Liquid acid Deutonnitrate of Mercury*, has been introduced as a powerful caustic, and has been much employed to destroy malignant ulcerations, especially when of a cancerous character. It is prepared as follows.—Take of *pure mercury*, 100 parts; *commercial nitric acid* (density about 1.380), 200 parts. Dissolve the mercury in the acid with the aid of heat, and evaporate until it is reduced to 225 parts.

It is applied by means of a camel's hair pencil; and if necessary the parts may be washed afterwards with water; or, where practicable, they may be covered with lint.

54. LIQUOR AMMO'NIÆ (Vol. i. p. 500,) is applied occasionally in cases of the bites of rabid animals, so as to destroy the surface with which it comes in contact.

55. CREASOTE (Vol. i. p. 498,) has proved beneficial as a caustic—applied pure, or diluted with water—in atonic, foul and offensive ulcers; in scrofulous caries; sloughing carbuncle; cancerous ulcerations; lupus, and condylomata. When undiluted, it may be applied by means of a camel's hair pencil.

56. NITRO-MURIATE OF GOLD has been applied to cancerous tumours and ulcers. It is prepared by dissolving six grains of chloride of gold in an ounce of aqua regia; and is applied like other corrosive agents,—care being taken that it is confined to the parts to be acted upon.

VII. EUTROPHICS.

Eutrophics defined—Alteratives—Modify the function of nutrition—Sorbefacients—Therapeutical application of eutrophics—Pressure—Friction—Special eutrophics.

It has been at all times admitted, that there are agents, which, when taken into the system in small doses, act on morbid structures and conditions, so as to occasion their removal, without any sensible evacuation or operation. To such remedies, the term *alteratives*,—[*Alterantia*, *Alloiotica*,]—has generally been applied; but in admitting such a class of therapeutical agents, caution is necessary, lest we should assign to the insensible influence of the remedy what ought to be ascribed to the recuperative power, which the system, and every part of it, possesses, and to which the author has had occasion to allude more than once in the course of these volumes. Perhaps there is no class of remedies that is more interesting and more difficult to be understood.

The term *alterative* has, however, been used indefinitely; and in reality every agent that we have thus far considered, must be esteemed an *alterative*, seeing that it must modify or *alter*, directly or indirectly, one or more of the functions. Tonics induce their effects by the impression they make on the nervous system; yet that impression is exerted slowly, and is not accompanied by any sensible evacuation: hence they seem to belong properly to the class of *alteratives*. In a modern work, indeed, the definition of these two classes of agents has been given in a manner somewhat different from the common acceptation. “There are agents,” says MM. Trousseau and Pidoux, “which afford to the organic elements something that survives the primary impression of the medicine; at times this is a constituent element, or a more perfect functional aptitude: these take the name of *Tonics*. At others, on the contrary, they change the character of the blood, render it less adapted for interstitial nutrition, and for furnishing elements for acute or chronic phlegmasiæ: these take the name of *alteratives*.” As the author is desirous of classifying under one head the different internal remedies which are capable of modifying the fluid of the circulation, so that when it permeates the intermediate system of vessels it may impress them differently, and thus alter morbid actions that may be taking place in them, he has adopted the term *EUTROPHICS* for this class of therapeutical agents.

Eutrophics—from *ευ*, “well,” and *τροφή* “nourishment”—may then be defined—agents whose action is exerted on the system of nutrition, without necessarily occasioning manifest increase in any of the secretions.

There are but two ways, perhaps, in which *alteratives* can exert their agency on the system; one is by the new impression they make directly on the nerves; the other, by the way of absorption. Tonics, it is probable, act in the former manner; eutrophics, which occasion absorption of the solid parts of the body,—most substances, indeed, which impress new activity on the capillary action,—generally in the latter.

If corrosive sublimate or arsenic be given in small and oft repeated

doses, in obstinate cutaneous affections, we may discover that the eruption fades gradually away ; and that, after a time, the parts are restored to health. The same thing happens, if we administer saccharine solutions in the manner described hereafter. All this occurs without any manifest evacuation ; and is, therefore, referable to eutrophic agency. The mode in which this is probably exerted, is by the changes produced in the circulating fluid by the substances in question. The altered fluid enters the intermediate circulation ; changes the character of the nutrition accomplished there, by the impression made on the capillary vessels ; and in this way a new action is assumed by them, which breaks in upon the old ; the affinities are modified ; and harmony succeeds to the irregularity of action previously existing. It is in this way, that we explain the efficacy of mineral waters, and many other agents, which have had the reputation of ‘purifying the blood ;’ and which doubtless impress changes on that fluid. We know, from direct experiment, that the presence of saline matter in the blood is essential to its due constitution, and conversion in the lungs ; and we can readily conceive, that saline substances, contained, in a dilute state, in mineral waters, may pass into the venous system by imbibition ; and so modify the constitution of the fluid of the circulation, that when it attains the intermediate circulatory system—where all nutrition is effected—the modified pabulum may so impress the organs that preside over nutritive exhalation, that new vigour may be communicated to the function ; and old morbid cachexies, or dyscrasies—as they are more frequently termed by the German writers—disappear. “Though great allowance,” says a modern observer, Mr. E. A. Jennings, “must be made for the effects of change of air, relaxation from business, change of habits, and other accidental circumstances, yet all candid observers must acknowledge, that when due allowance has been made for all these circumstances, a large residuum of cases remains where the most surprising good effects have been produced by a course of mineral waters. From the effects generally produced by them on the kidneys, it is evident, that a large portion of the water is absorbed, and it is probable that their good effect is to be attributed as much to the alteration they produce in the chemical character of the blood, by entering into its composition, as to the increase they occasion of the secretions of the bowels. My own observations and analyses would favour this opinion ; but they are, at present, too few to enable me to express any decided opinion on the subject.”

At one time, it was a common belief, that the condition of the blood may be extensively modified by the infusion of various substances into it ; but the plan is rarely adopted at the present day. It was even advised formerly, that blood should be taken from another individual, and transfused into the blood-vessels, to ‘alter’ the objectionable qualities of the circulating fluid ; but, at this time, *transfusion of blood* is only employed when the blood-vessels have been drained,—by uterine hemorrhage, for example. Fresh excitation has thus been communicated to the organs ; and the patient has appeared to rally, in some instances, where hope had been almost abandoned.

It is obviously only in diseases of a chronic character, that eutrophics can be employed. One of the essential elements of their operation is

time. None of them can act immediately, if we except the alterative effect of change of air, society, and scenery, the influence of which on morbid conditions—kept up by habit, as it were—is often as rapid as it is striking;—but these are tonic agencies. The reflecting practitioner will readily see, that in adopting any plan of alterative management, he must be guided by the great principles, which have been canvassed in the preceding chapters and sections; and especially in the one devoted to the consideration of REVELLENTS. Some of the revellents, employed in protracted disease, are altogether eutrophic. Of this nature are the preparations of mercury and iodine, administered to break in upon the morbid catenation in febrile, inflammatory, syphilitic, and other disorders, that have run on for a length of time; hence the eutrophic treatment of syphilis by mercury has been by modern syphilographers termed the *revellent*, in contra-distinction to the *simple*.

A class of sorbefacients has been admitted by a few writers on therapeutics. At one time, it appeared to the author to be necessary in order to explain the operation of a multitude of medicinal agents; and was accordingly adopted in the first edition of his ‘General Therapeutics;’ but farther reflection has induced him to class those agents under the head of Eutrophics. They are defined—agents that promote absorption: for, however it may be effected, the result of their successful operation is to give occasion to the taking up of that which has been deposited; yet this is unquestionably accomplished by the modification which they impress on the function of nutrition.

To understand the mode in which their agency is exerted, it may be well to inquire briefly into some of the phenomena of absorption and nutrition. In another work, (*Human Physiology*, Vol. i.,) the author has entered, at length, into the consideration of absorption, of which there are three great varieties,—*first*, that which is exerted by the skin and mucous membranes, and which, of course, includes chylosis;—*secondly*, that which is effected upon secreted fluids, which are termed ‘recrementitial,’ or, in other words, pass again into the mass of blood;—and *thirdly*, that which is concerned in the taking up of solid parts in the function of nutrition.

Every argument induces the belief, that from the commencement of existence until its final cessation, perpetual changes are taking place—both of absorption and deposition—which affect the decomposition and renovation of each organ, as well as of the different recrementitial fluids of the economy. The precise character of the apparatus, by which nutrition—as this important function has been termed—is accomplished, we have no means of knowing. Almost all admit, that the old matter must be directly or indirectly taken up by absorbents, and the new be deposited by arteries; but, as the precise arrangement of these minute arteries and absorbents is imperceptible to the eye, even when aided by optical instruments, their disposition has given occasion to much controversy. The generality of anatomists and physiologists conceive deposition to be effected by the minute arterial ramifications; but some presume, that inconceivably small vessels are given off from the capillary arteries, which constitute a distinct order, and whose function it is to exhale the nutritive deposit. Hence, these vessels have been

termed *exhalants* or *nutritive exhalants*; although, when the term is used by writers, they do not always pledge themselves to the existence of any distinct set of vessels; but merely mean by it the capillary vessels, whatever may be their nature, which, with the cells, are the agents of nutrition, and form from the blood, bone, muscle, tendon, ligament, &c., as the case may be.

A like discordance has existed regarding the precise agents of decomposition. All admit, as has been seen, that the absorbents receive the product of absorption; but all have not conceived that the action of taking up solid parts is accomplished immediately by absorbents. It was formerly believed, that there is a kind of spongy tissue, termed a 'parenchyma,' and that this sponge is situate at the extremities of the lymphatic vessels; that it is a vital sponge or vital parenchyma,—absorbing, in other words, by virtue of vital properties residing in it; but it was maintained that the solid parts of the body are broken down by the same agents—the extreme arteries—that secreted them; and being reduced to the proper fluid condition are imbibed by the vital sponge, and transmitted into the lymphatics. The author has elsewhere shown, that all this arrangement is supposititious; and that we know not positively how the exhalants and absorbents are disposed in the capillary system. Independently of anatomical considerations, it does not seem probable, that the same vessels are endowed with antagonizing powers, of pulling down, and building up; although it is probable, that the texture of a part to be absorbed is modified by the secretion of fluid, as we know to be the case, when adventitious coagula are removed from the brain. The areolar tissue, condensed by the pressure, forms a serous membrane surrounding the coagulum; and this membrane secretes a fluid, which reduces the clot to the liquid state, so that it can be absorbed.

An attentive examination of the functions of absorption and nutrition seems to lead to the conclusion,—that the chyliiferous and lymphatic vessels form only chyle and lymph; that the veins admit every liquid, which possesses the necessary tenuity; and that, whilst all absorptions—which require the substance acted upon to be decomposed and transformed—are effected, through the agency of cells, by the chyliiferous and lymphatic vessels, those that require no alteration are accomplished directly through the coats of the veins by imbibition.

The agents to which the absorption of decomposition, or—what has been termed—'interstitial' or 'organic' absorption, should be referred, can, therefore, be readily deduced. As it is exerted on solids; and as these cannot pass through the coats of the vessels in their solid condition, it follows, that other agents than the veins must accomplish the process; and, again, as we never find in the lymphatic vessels any thing but lymph; and as we have every reason to believe, that an action of selection is exerted at their extremities, similar to that of the chyliiferous vessels on the heterogeneous substances exposed to them; we naturally look to the lymphatics as the sole organs, concerned in the absorption of solids.

With regard to the absorption of recrementitial humors, less difficulty exists. Where they possess the necessary tenuity, they may pass into

the blood-vessels by imbibition, or they may be taken up by the lymphatics, and conveyed into the circulation.

It is obvious, that, in the case of all these fluids, a nice balance must exist between the quantity exhaled, and that which is taken up again by the absorbents; and if, from any cause, the balance should be destroyed, so that the exhalants are in a state of super-excitation,—or the absorbents in a state of diminished action, whilst the exhalation is healthy,—accumulation of fluid arises; and hence, the dropsical effusion into serous or cellular cavities—constituting hydrothorax, hydrops pericardii, ascites, &c.—may be either of an active or more passive kind; and the treatment may have to be modified accordingly. But these—as the author has before observed—are not the only causes that give rise to such accumulations. A viscus of the thorax or abdomen may, from protracted irritation, become engorged, indurated, or obstructed; and from this mechanical cause, the circulation through it may be impeded; accumulation of blood in the vessels—in other words, turgescence or congestion—supervenes; and the watery portions transude. These are the worst kind of dropsies, because they arise from organic mischief, which does not itself admit perhaps of cure.

The activity of absorption is much modified by the state of repletion, or the contrary, of the vessels; as well as by the condition of the vessels themselves, as regards the presence or absence of excitement. If fluid be thrown into the vessels of a living animal so as to induce artificial plethora, and any absorbable fluid be placed in the cavity of the peritoneum, absorption is apparently null,—or, at least, imperceptible; but if blood-letting be practised, so as to diminish considerably the amount of the circulating fluid, the liquid, thrown into the cavity of the peritoneum, is seen to disappear gradually as the blood is withdrawn. Hence, we infer, that blood-letting must be an important remedial agent in many cases of dropsy; and the same remark applies, although to a less extent, to every kind of depleting agent.

That the energy of absorption is materially modified by the condition of the absorbing surface is well exemplified, as a modern writer—Professor Jackson, of Philadelphia—has observed, in the congestions, and consequent remora of the circulation, so frequently existing in the gastro-enteric mucous membrane in the advanced period of fevers, in which “medicinal substances, and remedies addressed to that surface, fail to produce their effects. Patients in this state cannot be salivated; the mercurial medicine remains on the surface to which it is applied; stimulants, diuretics, diaphoretics, disappoint of their expected operation. Even fluids cease often to be absorbed, and accumulate in the stomach and intestines, where they are found with the remedies administered before death.” The same fact is exhibited in malignant cholera, in which it is impossible to produce absorption—in the advanced stages of the disease at least—by any agency; and hence, it has been proposed to throw fluids immediately into the mass of blood by injection: a course, which has not, however, fulfilled all the ends, that were at one time, somewhat extravagantly, expected from it.

Cases of hypertrophy of different organs afford an example of that loss of compensation between exhalants and absorbents, which has been

described as a cause of dropsy. The writer, to whom reference has just been made, considers it "extremely equivocal," whether dropsy be ever the result of a suspension of absorption alone, or simply from a loss in the equipoise of secretion or exhalation, and absorption. No facts, he thinks, justify the conclusion. But the circumstance, that certain agents so modify nutrition as to occasion the taking up of hypertrophied parts, appears to be a sufficient reply to this. The exhalants are already too much excited; and yet a peculiar 'stimulant' gives occasion to the predominance of absorption,—of course by acting on a different set of vessels than the exhalants; for, if the excitant property were exerted upon them, the hypertrophy ought to augment, rather than diminish,—a circumstance, which seems to refute the idea, that the exhalants fulfil the double function of depositing and breaking down, in nutrition; and confirms the almost universally received opinion, that the exhalants are endowed with the former office—the absorbents with the latter; the immediate agents, however, being the nucleated cells of which every tissue is composed.

Connected with the subject of hypertrophy, M. Andral has the following judicious remarks, which accord with the views that have always been entertained and taught by the author. "If from the simple observation of the phenomenon of hypertrophy, we pass to the study of its causes, what do we find? Do we consider that we have explained the formation of this state by a greater afflux of blood than common towards the part which is to be hypertrophied? This congestion of blood may doubtless be conceived to play some part in the production of the hypertrophy. But, theoretically speaking, it neither appears to me to be the sole nor even the necessary condition. It is not the sole condition; for the unusual appeal of blood towards an organ might take place in vain; it would but engorge it without changing its tissue if there was not, in the organ itself, an augmentation of the ordinary assimilative force: in this last condition, if I may use the expression, the assimilative force elaborates more actively the materials which the blood carries to it, and in order that it may draw them in superabundant quantity into its nutritive whirlpool, (*tourbillon nutritif*), it is necessary to suppose that more blood arrives at it in a given time. But is this excess of assimilative force itself necessary for the production of every hypertrophy, and may we not conceive cases, in which this force, remaining the same, there is a diminution of that other force, called disassimilating, (*désassimilatrice*), by virtue of which the molecules of the solids are incessantly separated, to enter again into the mass of blood whence they had been drawn? Is it not owing to this, that more than one case of hypertrophy, ineffectually treated by emollients, and blood-letting, have disappeared under the influence of stimulating substances, (iodine, mercury, &c.)? From these theoretical considerations, we arrive at the observation of facts, from which we may deduce the following conclusions. *First*. Hypertrophy is produced by the simple fact of an augmentation of habitual activity in the exercise of the functions of organs. *Secondly*. Other hypertrophies occur in consequence of active hyperæmia,—acute, but particularly chronic. In such case, we observe, that at times the hypertrophy exists only in the tissue,

which has been irritated and in a state of hyperæmia; and, at others, after the return of the latter to its healthy state, the neighbouring tissues, which were slowly modified in their nutrition, remain diseased, and hypertrophied. This may be proved in many cases of phlegmasia of the internal and external tegumentary membranes. *Thirdly.* There are cases of hypertrophy in the production of which we can only from analogy with the preceding cases admit the existence of a stimulus—physiological, or pathological—in the organ in which it is situate. We say, then, that there is nutritive irritation in such organ; but why might we not say as well, that there is a diminution of activity in its regular action of decomposition? In both these opinions I see only hypotheses. If such be the case, let not the therapeutics be supported exclusively on either of these opinions; but, taking the hypertrophy for fact, seek experimentally for the means of combating and destroying it. Thus, iodine has been found a remedy for hypertrophy of the thyroid gland; and mercury has been found capable of destroying certain exostoses, which are a true hypertrophy of the osseous tissue. Moreover, amongst those hypertrophies, whose cause has not been proved to be an antecedent or actual stimulation of the organ which is the seat of it, some consist of a purely local affection; some appear to be intimately connected with the general nutritive movement; they are only, so to say, one of the prominent expressions, that indicate or reveal the profound modifications, which the nutritive movement has undergone in every molecule of the body. Scrofulous individuals are in this category. Amongst the different groups of morbid phenomena presented by these individuals,—who has not remarked the simultaneous hypertrophy, which the thyroid gland, the brain, several parts of the osseous system, the liver, the tongue and the upper lip undergo in them? He would appear to us but little of a physiologist, who, in each of these modifications of nutrition, saw only a local affection, and restricted his endeavours to the removal of it.”

Therapeutical application of Eutrophics.

From what has been said, the therapeutical application of eutrophics may be intelligible. Were we possessed of remedies, which act specifically on particular parts of the system of nutrition, all that would be requisite would be,—to select them according to the precise affection. As yet, however, we know of scarcely an agent that exhibits its special properties on any particular organ or tissue. Iodine is, perhaps, the only one. Its action appears to be exerted on the system of nutrition generally; but more especially on that of the thyroid gland when enlarged.

Where the object is to promote the absorption of any accumulation of recrementitial fluid—as in the case of dropsical collections—the sorbefacients we employ affect the system generally, and, through it, the pathological condition, which gives occasion to the accumulation. Hence, in active dropsies, blood-letting is doubly indicated. It reduces the erethism of the exhalants; and, by diminishing the quantity of circulating fluid, adds materially to the absorbent energy; for, it has been

seen, that in experiments on living animals, fluid is observed to be taken up from the serous cavities as blood is made to flow from a vessel. Somewhat in the same manner, cathartics, as well as diuretics, exert their beneficial agency. They detract from the fluid of the circulation; but, in addition, like cathartics, occasion a concentration of vital activity towards the organ on which their specific stimulation is exerted; and in this way, occasion the imbibition of the exhaled humour.

The effect of mercury is to bring on a new action in the secretory system, on which it seems to act as a specific excitant. In this way, it becomes eutrophic, and is more frequently perhaps employed than any other, except iodine. Any local stimulant may be indirectly the cause of the disappearance of morbid parts, by modifying nutrition; but there are few agents that act by stimulating specifically the absorbent system of the part; they generally produce their effect, by occasioning a concentration of vital activity towards some other part of the organism, and, under this operation, absorption is rendered more active. Experience appears to show, that the administration of the alkalies is followed by sorbefacient effects, and Dr. G. Burrows, in his *Gulstonian lectures* for 1834, attributes their agency in promoting absorption to their affecting the parts to be absorbed—as they affect them out of the body—by rendering them more soluble; and, consequently, more readily absorbed.

There are agencies, that modify nutrition indirectly, but not by any change they induce in the fluid of the circulation, and which may, therefore, be called *INDIRECT EUTROPHICS*. The effect of tonics has been already referred to. The influence of the nervous system, as a modifier of nutritive action, is strongly exemplified, when powerful impressions are made upon it.

Of this, we have examples in the effect of the imagination in discussing tumours of various kinds. Some growths are possessed of but little vitality; and if the nervous and vascular influence be detracted from them, they speedily die. This is the way in which charms remove warts. It is a popular superstition, that a dead man's hand rubbed on a wen, or an enlarged gland, will dispel it; and such is the occasional result; as *Perkinism*, touching for the king's evil, &c., &c., are sorbefacient. It appears, consequently, that anything—of a physical or moral nature—that concentrates the vital activity on any part of the organism, may diminish the amount of exhalation in another part; and at the same time modify the function of absorption; and, under this change in nutrition, parts may be reduced in bulk; morbid tumours disappear; and dropsical accumulations be absorbed.

It is a general rule, applicable, perhaps, to every organ in the body, that its nutrition is augmented under appropriate exercise; and that inaction is attended with more or less atrophy. This is manifested in the muscles of the arm of the prize fighter and fencer, which, in comparison with those of mankind in general, appear to be hypertrophied. There are, however, certain secretions, which are more plenteously effected during inaction, and the absence of all stimulation,—the secretion of fat, for instance; accordingly, if we are desirous of fattening animals, or of inducing artificial obesity, we keep them at rest, and in

total obscurity; in order that they may not even experience the augmentation of the cutaneous and other secretions, which the slight stimulation of light occasions. In like manner, castration and spaying dispose to obesity, by removing the excitations, which the venereal passion engenders; and, hence, the proverbial fatness of the eunuch, both in man and animals. These two cases of nutritive exhalation are constantly opposed to each other. Exercise develops the muscular fibre; whilst want of it augments the exhalation of the fluid, which is deposited between the muscular fibres and fasciculi; and which gives the rotundity so much admired in the delicate muscles of the female. In one case, we have hypertrophy of the organ exercised; in the other, hypertrophy of the adipous exhalation.

The influence of exercise and inaction on the production of fat has been accounted for ingeniously by Liebig. "A cow or a sheep in the meadow," he observes, "eats almost without interruption, as long as the sun is above the horizon. Their system possesses the power of converting into organized tissues all the food they devour beyond the quantity required for merely supplying the waste of their bodies. All the excess of blood produced is converted into cellular and muscular tissue; the graminivorous animal becomes fleshy and plump, while the flesh of the carnivorous animal is always tough and sinewy. If we consider the case of a stag, a roe deer, or a hare, animals which consume the same food as cattle and sheep, it is evident, that when well supplied with food, their growth in size, their fattening, must depend on the quantity of vegetable albumen, fibrin or casein, which they consume. With free and unimpeded motion and exercise, enough of oxygen is absorbed to consume the carbon of the gum, sugar and starch, and of all similar constituents of their food. But all this is very differently arranged in our domestic animals, when, with an abundant supply of food, we check the process of cooling and exhalation, as we do when we feed them in stables, where free motion is impossible. The stall-fed animal eats, and reposes merely for digestion. It devours in the shape of nitrogenized compounds far more food than is required for reproduction, or the supply of waste alone; and at the same time it eats far more of substances devoid of nitrogen than is necessary merely to support respiration and to keep up animal heat. Want of exercise and diminished cooling are equivalent to a deficient supply of oxygen; for when these circumstances occur, the animal absorbs much less oxygen than is required to convert into carbonic acid the carbon of the substances destined for respiration. Only a small part of the excess of carbon thus occasioned is expelled from the body in the horse and ox, in the form of hippuric acid; and all the remainder is employed in the production of a substance, which, in the normal state, only occurs in small quantity as a constituent of the nerves and brain. This substance is *fat*."—"The flesh of wild animals is devoid of fat; while that of stall-fed animals is covered with that substance. When the fattened animal is allowed to move more freely in the air, or compelled to draw heavy burdens, the fat again disappears. It is evident, therefore, that the formation of fat in the animal body is the result of a want of due

proportion between the food taken into the stomach and the oxygen absorbed by the lungs and the skin."

It follows from these remarks, that if we wish to render the nutrition of an organ more active, we must take measures for keeping it in appropriate action ; and that, on the other hand, if we desire to diminish the nutritive exhalation, whose office is subsidiary to the organs, we must inculcate the due employment of corporeal exercise, with the view of augmenting the depuration accomplished by the cutaneous and pulmonary transpirations.

PRESSURE is a sorbefacient influence, employed by the surgeon especially. If a fractured arm be kept firmly bound by splints and bandages, for the ordinary period of a few weeks ; the arm is found much attenuated when the splints are removed, in consequence of the modification of nutrition induced by the pressure. A knowledge of this and similar facts has led the surgeon to employ pressure in cases of ulcers, tumours, and morbid growths, where the application is at all feasible ; and, in this way, extensive ulcers have been made to heal ; and large tumours to disappear. A Mr. Young, of London, acquired much celebrity by this mode of treatment in scirrhus and cancer ; and, although, in such cases, it must unfortunately too often fail, good effects were certainly produced by it in his hands, as they have occasionally been in those of others. It is, however, in the less malign kinds of morbid growths, that the remedy is most effectual,—more so, indeed, than perhaps any other plan of treatment. But it is not alone in cases of hypertrophies of the kind referred to, that pressure has been employed. Methodically used, it has been found useful in dropsical infiltrations into the areolar membrane of the lower extremities, as well as in ascites, and dropsical affections of other splanchnic cavities. In enlargements and dropsy of the ovaries, and other tumours within the abdomen, methodical compression has likewise been of essential benefit. In some cases of ovarian enlargement, the author has found an appropriate bandage around the abdomen of great service. Not only has it supported the parietes of the abdomen and the contained parts, in sudden shocks ; but it appears to have even lessened the hypertrophy.

Of late years, compression has been recommended in inflammatory affections, as in acute rheumatism ; in phlegmonous and erysipelatous inflammation of the extremities ; in severe burns ; in inflammation of the synovial apparatus ; orchitis ; &c. ; and in many cases it has been productive of great advantage ;—acting probably in two ways,—first, by diminishing the circulation in the intermediate system of vessels concerned in the pathological condition ; and secondly, by restoring tone to the over-dilated capillaries.

FRICTION is another remedy belonging to the division now under consideration ; and it is one often had recourse to by the surgeon with signal benefit. After violent sprains, in which much fluid has been effused into the cellular membrane, there is no mode of medication, which occasions the absorption of the effused fluid so rapidly as rubbing the part with the hand simply dipped in flour, or covered with some liniment. The object of dipping the hand in flour is to prevent the abrasion, which

would necessarily result from the friction ; and in the generality of cases, liniments are of no other service. This, at least, applies to simple oleaginous liniments ; but where stimulating substances are added, some additional influence may be exerted by them. To produce the full sorbefacient effect, in the cases mentioned, the friction must be continued for a long time,—for at least half an hour ;—and it must be repeated as the case may seem to require. In Scotland, there are women, who obtain a livelihood by this kind of *dry rubbing*, and whose celebrity is such, that the author has known respectable patients go from a border county of England to Edinburgh to be operated on by them.

From all that has been said, it is clear, that we have, in the class of eutrophics, a number of valuable remedial agents, that may be adapted for various states of disease, which—as in the case of different cachexies—may have resisted other modes of management.

SPECIAL EUTROPHICS.

HYDRARGYRI PRÆPARATA.—PREPARATIONS OF MERCURY.

There are few articles in the lists of the *Materia Medica*, that are possessed of equal interest with mercury ; or that play so important a part in the history of medicine ; and although it is considered less essential in syphilis, since it has ceased to be regarded as an ‘antidote’ to that malady, it is still one of the most valuable of therapeutical agents. It is considered to have been first employed by the Arabians, but only as an antiparasitic or destroyer of vermin ; and externally in cutaneous affections. Paracelsus is said to have first introduced its internal employment.

When mercurials are given in small and repeated doses, it is speedily observed, that their action is exerted on the secretory apparatus ; and perhaps preceding—certainly accompanying—this action, more or less excitement may be detected, if we carefully note the condition of the circulatory apparatus. The biliary, salivary, and pancreatic fluids, and the fluids of the gastro-enteric mucous membrane, are secreted in larger quantity ; the cutaneous and urinary depurations are augmented ; and under this increase of the secretions, nutrition becomes modified ; the absorbent system appears to be more active, and fluids that have accumulated in areolar spaces or serous cavities, or solid matters that have been deposited so as to constitute hypertrophies of various kinds, disappear under its employment. At times, however, a true mercurial fever is excited, under which, as under other febrile conditions, the various secretions are diminished in quantity, and modified in character. When carried still farther than this, their peculiar preference for the salivary glands and the parts about the mouth is exhibited ; which assume an unwonted energy of secretion, so that several pints, in cases of excessive mercurial ptyalism, may be discharged in the course of the twenty-four hours.

The precursory phenomena usually are,—tenderness, tumefaction, and pale rosy colour of the gums, except at the very margins, where

they are deep red. The gums gradually fall away from the teeth; and a white secretion occupies the portion of the tooth from which they have subsided. The mouth becomes sore; the tongue swollen; the teeth are tender when pressed against each other, and loose; the breath acquires a characteristic fœtor; and a coppery taste is experienced. In this state, the mouth is said to be unequivocally "touched" by mercury; and it would be well if the effects could, when desired, be thus limited. Either from accident or design, they may, however, extend much farther; the salivary glands may become tender and tumefied, and increase their secretion profusely; and as, when once induced, ptyalism is an affection that generally continues unmodified by medicine, or is self-limited, enduring for days and sometimes for weeks, the whole system suffers, partly from the extent of the discharge, but still more from the suffering and irritative fever that accompany it. At one time, it was supposed, that the mercury is thrown off in the fluid of the ptyalism; but careful analysis by skilful chemists has entirely failed in detecting the smallest particle of the metal in that fluid.

Such are the phenomena that may be induced by mercury, when given for the cure of disease; and they may be caused at any time, and on any one, except on the rare few who are unsusceptible of its action, provided the mercury be continued sufficiently long. Some persons are unusually impressible to it; and are salivated by very small quantities; and the author has observed, more especially in public practice, that particular seasons and local influences have rendered patients exceedingly susceptible, so that a few grains of *Pilulæ Hydrargyri* have caused salivation; when, at other times, a long protracted use of a more active preparation of mercury would have been required to induce the same effect. It has been elsewhere remarked, that it is extremely difficult to affect the system of an infant under two years of age, whilst at an after period it may be extremely susceptible to its action. Eminent observers—as Dr. John Clarke, and Messrs. Evanson and Maunsell—have, indeed, affirmed, that they never saw a child under three years of age salivated by mercury. It is, doubtless, a very rare occurrence; but when it has taken place, it has generally been very intractable. Dr. J. B. Beck, of New York, gives the case of a child, two years of age, salivated by five grains of calomel, administered in three portions at intervals within the space of about twelve hours. "When salivation does take place in the infant, as it sometimes does, its effects are most disastrous. Sloughing of the gums and cheeks, general prostration and death are by no means uncommon occurrences;"—and he infers, from the results of his observation and inquiries, that although young subjects are salivated with great difficulty, the effects of mercury are frequently more energetic and uncertain than they are in the adult.

Again, there are persons who are salivated whenever they take a few grains of calomel. In some constitutions, mercury acts as a true poison, causing what has been termed *mercurial erethism*, or a febrile condition characterized by great adynamia; in which, on the occurrence of some emotion or exertion, the individual may suddenly expire. (J. Pearson.) The author saw a fatal case of the kind in which mercurial erethism was induced by the application of *Unguentum*

oxidi rubri to a sore on the leg. In this case, there was a vesicular eruption to which the name *Eczema mercuriale* has been given, and which is unquestionably induced by mercury in particular individuals.

Besides these effects, a train of phenomena, strikingly like those of syphilis, have been ascribed to mercury. To the aggregate of these, the names *hydrargyriasis*, *mercurial disease*, *mercurial cachexy*, and, by some, *pseudo-syphilis*, have been assigned. Amongst them may be enumerated,—mercurial iritis; sloughing ulceration of the fauces; inflammation and caries of bones; periostitis; mercurial tremors, cachexia, &c.; but difficulty in appreciating the precise causes of some of these,—whether, for example, they should be ascribed to syphilis or to mercury—arises from the fact, that mercury has generally been prescribed. Some, indeed, affirm, that caries of the bones never occurs in syphilis unless where mercury has been given; but the remark needs confirmation.

The consequences of the ptyalism occasioned by mercury are at times awful;—sloughing of the soft parts of the mouth and throat; loss of teeth; caries of the jaw bones; adhesion of the cheeks to the gums, and ligamentous bands preventing the depression of the lower jaw. Awful cases of deformity are, indeed, occasionally witnessed from the abuse of this potent agent. Formerly, these cases succeeded generally to its administration for syphilis: now, we witness them more frequently as the sequelæ of the treatment of remittent and other fevers, in which it is the custom, with some, to administer calomel in excessive quantities.

As to the mode in which the effects of mercury are exerted on the system, not much difference of sentiment exists. That it is absorbed is shown by the fact, that metallic mercury has been discovered in the bones and other parts where salts of mercury had been taken freely. It has likewise been found in the blood, although it is not easy to detect any inorganic substance when it is mixed, as in that fluid, with compounds of organization; and that it is given off by transpiration is shown by the fact, that a gold watch, worn by one taking mercury, is coated with the metal.

The precise nature of the action of mercury on the animal economy has been a matter of dispute. We have seen that it passes into the mass of blood; and, doubtless—like eutrophics in general—it modifies the condition of that fluid, so that a new action is caused by it on the systems of secretion and nutrition; but of the precise mode in which this is accomplished, we know no more than we do of the *modus operandi* of other articles of the class, or indeed of any of the classes of therapeutical agents.

It was elsewhere stated, (Vol. i. p. 267,) that mercury has been ranked by some amongst sialagogues; that salivation is one of the remote effects of its administration; and that this result is never necessary, and rather to be deplored, inasmuch as the increased discharge exhausts and irritates, without producing the desired benefit. It is sufficient if the mouth be ‘touched,’ and this condition be kept up for a sufficient length of time, to have all the benefit, that mercury is capa-

ble of accomplishing. To produce this result various methods are adopted. Perhaps the best of all is to rub in *Unguentum Hydrargyri* according to the rules advised hereafter. In this way, no danger exists of disturbing the bowels; and the only inconvenience is the sustained and repeated friction. This friction is usually made on the inside of the thigh or of the arm, in consequence of the epidermis being thinner there, so that the mercury is more readily forced through it, and comes in contact with the absorbents of the true skin. For a similar reason, calomel has been rubbed on the inside of the cheeks and gums, care being taken not to swallow the saliva, for fear of inducing diarrhoea. Calomel, sulphuret of mercury, and the protoxide, have been used in the way of fumigation for the same purpose; and ptyalism has resulted from their employment in this manner, after their internal and iatralectic use had been tried in vain.

After all, however, it is so much more easy to take the remedy internally, that in the generality of cases, to produce the full eutrophic effect of mercury, this method is adopted,—unless it should act upon the bowels, so as to prevent the constitutional effect from supervening. The most common preparation prescribed for this purpose is the mild chloride, and next to it pilulæ hydrargyri. Generally, the effects of the mercury will be perceptible on the gums in the course of a few days; but, at times, it is exceedingly difficult to produce any manifestation of its action. Should the diseased condition yield under its use, this is not a matter of moment; but if it be desirable to excite a more decided action, remedies may be employed that favour absorption,—such as blood-letting and emetics; under the operation of which *mercurialism* often declares itself speedily; and occasionally to such an extent as to favour the idea that an accumulation may have taken place in the system. Often, after the internal use of mercury has been tried in vain, its effects are rapidly developed, when inunction is employed along with it.

Whilst the patient is under the effects of mercury, his diet should be regulated; and he should be careful to avoid partial and irregular exposure to cold and moisture. The system is rendered impressible, and rheumatic and other disorders have resulted from a neglect of these precautions, which have rendered the individual a cripple for life. In regard to the treatment to be pursued during the existence of mercurial ptyalism, and for the removal of its sequelæ, the author must refer to another work, (*Practice of Medicine*, 3d edit., i. 618, Philad. 1848).

The diseases in which the eutrophic virtues of mercury have been witnessed are numerous. Difference of sentiment has existed in regard to its use in fevers. At the commencement of none of them is it perhaps advisable except as a cathartic; but in after stages, especially when mischief exists in any organ, or when the morbid actions appear to continue, as it were, from association, the new action, induced by it, is often most salutary. It is difficult, however, to affect the mouth in these cases, even when the internal use of the remedy is conjoined with the external; and it has been affirmed by some, that when we do succeed in 'touching' the mouth, it is rather an evidence of the previous subsidence of febrile action, than that benefit has been caused by the

mercury. Howsoever this may be, the occurrence of approaching pyalism is favourable; and some observers have affirmed, that death rarely takes place after salivation has been once established. The author has, however, seen more than one example to the contrary. The routine practice in many parts of this country, and in tropical climates, is to give calomel in excessive doses from the very commencement of the affection.

In inflammations mercury has been greatly employed,—generally, perhaps, as a cathartic; but often as a eutrophic. It has been elsewhere remarked, that large doses of calomel are looked upon as sedative; and with this view it has been prescribed in inflammation; and occasionally, also, in fever. Attempts have been made to show, that it is more advantageous in inflammations of particular organs than of others,—in the phlegmasiæ of serous rather than in those of mucous membranes, although the contrary has been maintained by some;—that it is especially valuable in diphtheritic inflammations, by the power which it possesses of diminishing the plastic properties of the blood,—and that, therefore, it has been presumed, it may prevent a farther effusion of membraniform matter—as in croup—and favour the softening and absorption of that which has been already effused;—that its eutrophic action is more exerted upon particular organs, as the liver; and hence, especially after blood-letting, it has been regarded as an admirable remedy in hepatitis, acute and chronic—especially in that so common in hot climates:—but the same principle is probably at the basis of its beneficial agency in all these cases. By the new action, which it causes in the system generally, and in the secretory and nutritive functions especially, it operates as a revellent, and derives from the morbid action going on in a part of the organism. We can hardly suppose its effects to be exerted in any other manner in syphilis. Scarcely an observer of the present day regards mercury as an “antidote” to that affection. It has been shown indisputably, that in the large mass of cases, the disease is removable without a particle of mercury; and when mercury is considered to be advisable, where the disease is making frightful progress, it is freely administered under the belief,—that being a potent article and capable of exciting a new and engrossing morbid condition of the organism, it may so far interfere with the *vice* in the system of nutrition as to completely change the original morbid condition. It is now rarely employed, except in such cases. Some there are, indeed, and men of no little weight in the profession, who denounce mercury, and affirm that it is unnecessary, and always injurious in every case of syphilis; but the author has seen instances in which nothing but a eutrophic remedy, possessed of such potency, was capable of arresting the progress of the malady. Iodine and other articles had been tried in vain; and the diseased action subsequently yielded to the establishment of mercurialism. Yet these cases, he admits, are rare.

A remark is necessary regarding the power ascribed to mercury of diminishing the plastic properties of the blood. Were it really possessed of them we should expect a diminution in the proportion of the fibrinous element under its use; yet such is not the fact. M. Andral examined the blood in different cases of mercurial stomatitis, and disco-

vered an increase in the quantity of fibrin, corresponding to the severity of the local phlegmasia. Others have considered, that it diminishes the quantity of red corpuscles, which would equally increase the ratio of the fibrin. The salutary operation of mercury in the phlegmasiæ is, therefore, probably dependent wholly upon its revellent powers.

In almost every form of cachexia, mercury has been administered, and, where cautiously given, evil can scarcely result from it. Many of these cachexiæ are accompanied by an impaired state of all the functions, which the irritation of mercury is calculated to develope; even when the new action induced by it might hold out prospects of benefit in respect to certain of the phenomena. Tuberculosis, for example, is evidently favoured by impaired or defective nutrition; and can be developed under influences, which are capable of inducing this. Hence, if salivation should be produced accidentally or by design, it could scarcely fail to prove injurious. In the tuberculous or scrofulous cachexia, mercury is, therefore, rarely employed; nor can its full action be considered well adapted for the chlorotic, scorbutic, rhachitic, hydroptic, or the cancerous. Still, accidental circumstances may arise in all these to render the cautious administration of mercurials advisable; as, for example, where the dropsy is dependent upon, or accompanied by, morbid depositions, which require the induction of a new action in the system of nutrition.

When cholera first appeared in this country, much was said of the good effects to be derived from the employment of mercury, especially after blood-letting had been premised; and perhaps—after all—as much benefit was to be expected from such a combination as from any that could be devised. Blood-letting was calculated to diminish the excited action of the vessels of the lining membrane of the intestines; and the new action, induced by the influence of the remedy, was well adapted for arresting it. The disease was, in too many cases, wholly intractable. Mercury was, however, often administered to an extent, which admits of no adequate justification. Pounds of calomel were given in a single case; and inunction was extensively combined with it. The mortality was much alike, however; and we have not sufficient evidence to determine, that the progress of the disease was materially modified by any particular mode of management.

Wherever a complaint appears endemically, epidemically, or sporadically, and assumes a malignant aspect, and especially if it be accompanied by visceral hyperæmia or inflammation running rapidly to disorganization, mercury is had recourse to; and often judiciously. Unless these cases can be arrested by a powerful revellent or eutrophic agency, they necessarily proceed speedily to a fatal termination.

It is impossible to depict every case in which this valuable agent—valuable when properly, most injurious when carelessly prescribed—is capable of affording benefit. In all chronic affections, characterised by morbid depositions or hypertrophies, its use is invoked, unless special considerations should seem to forbid it. It has even been recommended in paralysis—encephalic paralysis; and Dr. Pereira states, that he has seen hemiplegia, with impaired vision and hearing, headache, and cramps of the extremities, recover under its use, after blood-letting,

purgatives, &c., had failed. The patient, a young man, was kept under its influence for two months. Still, much can scarcely be expected from it in the generality of such cases.

In all the neuroses, it has been used ; and the new condition, induced by it, may be beneficial. Such appears to have been the occasional result in neuralgia.

1. HYDRARGYRUM.—MERCURY.

Metallic Mercury is found either pure, constituting *native* or *virgin mercury*, and existing in the form of globules in the cavities of other ores of the metal, or combined with silver ; but it is chiefly obtained from bisulphuret of mercury or *native cinnabar* ; the principal mines of which are at Idria, and at Almaden in Spain ; at Durasno, in Mexico ; near Azogue, in New Grenada ; and near Huancavelica, in Peru ; and a rich mine has been discovered in Upper California, midway between San Francisco and Monterey. From this it is obtained by distillation with iron or lime. Native mercury is separated by distillation from its associated impurities.

Of 314,286 pounds of mercury imported into England in 1831, 269,558 pounds, according to Mr. M'Culloch, were carried directly from Spain ; and 13,714 pounds from Gibraltar : of the latter a part was derived from Carniola, and a part from Spain ; 31,014 pounds were imported from Italy ; only 192,310 pounds were retained for home consumption. It comes to this country chiefly from the Atlantic ports of Spain, particularly Cadiz. A considerable portion is also received from Trieste. In the year ending September, 1832, the value of the quicksilver imported into the United States exceeded two hundred and sixty-three thousand dollars ; a large portion of which was again exported to Mexico, Chili, and China. (Wood and Bache.)

The specific gravity of mercury is 13.5 : it should be wholly volatilized by heat, and dissolved without residue, by nitric acid. When pure—as it ought to be for pharmaceutical purposes—a globule, made to roll over white paper, should leave no trace. Pure sulphuric acid, agitated with it at common temperatures, and afterwards evaporated, leaves no residue.

Difference of sentiment has existed in regard to the action of metallic mercury when swallowed ; but there can be little doubt that it is devoid of any on the economy. It is affirmed, indeed, that when it has been long retained in the bowels, it has exerted injurious effects ; and this is possible, owing to the metal becoming oxidized, and uniting perhaps with the gastric acids. It has been elsewhere remarked, that a decoction of quicksilver has been advised as anthelmintic, but it is probably inert. Empirically, large quantities of quicksilver have been given in obstinate obstruction of the bowels ; and it has been conceived to be especially adapted for cases of intussusception ; but it can be of no avail in the progressive form ; and could scarcely fail to be injurious in the retrograde. Moreover, we have no phenomena by which we can

judge accurately which form exists in any particular case. At the present day, metallic mercury is never prescribed.

When applied externally, mercury would seem to have occasionally exerted its specific effects upon the system. A fatal case is recorded, in which salivation was induced by wearing at the breast, for six years, a leathern bag containing a few drachms of liquid mercury, as a prophylactic against itch and vermin.

Workers in mercury have been long known to be subject to various affections of the nervous system especially; of which one of the most remarkable is a form of shaking palsy, *mercurial tremor* or *trembling*; and should the workman persist in his occupation, it is apt to end in fatal apoplexy or epilepsy. This condition is met with not only in those who are engaged in quicksilver mines, but in looking-glass and barometer makers, &c., and it is not easily removed. Difference of sentiment, however, exists on this point; for whilst one writer, Dr. Christison, states, that the tremors are cured easily, though slowly; another, Dr. Pereira, affirms, that he has not seen the least benefit obtained by remedial measures, although various modes of treatment were tried. One of the most striking cases of the effects of mercurial vapour is the following. In 1810, the Triumph man-of-war, and the Phipps schooner, received on board several tons of quicksilver, which had been saved from the wreck of a vessel. In consequence of the rotting of the bags, the mercury escaped; and the whole of the crews became more or less affected. In the course of three weeks, two hundred men were salivated; two died, and all the animals, cats, dogs, sheep, fowls, a canary bird, and even rats, mice and cockroaches were destroyed. The question in these cases arose, whether the mercury, to produce this action, were merely in a state of division, or were oxidized? It has already been seen, that metallic mercury appears to be devoid of any action on the organism; and hence it does not seem probable, that when finely divided it could exert any. Some, however, think that it is poisonous; others believe, that its action is dependent upon a portion of the metal being oxidized. It has been found, indeed, that the vapour disengaged from mercury at atmospheric temperatures contains some oxide.

2. HYDRARGYRUM CUM CRETA.—MERCURY WITH CHALK.

(*Hydrargyr.* ℥ij; *Cretæ præparat.* ℥v, rubbed together till the globules disappear.) The prevalent opinion is, that when mercury is triturated with chalk, the metal is merely divided mechanically; but from its effects upon the economy, and for other reasons stated elsewhere, (Vol. i. p. 188,) it is probable, that a portion at least is oxidized.

The preparation is generally obtained by our druggists from abroad—and the author has seen specimens, which were evidently adulterated with red oxide of mercury; and which, in some cases, excited the most violent vomiting and purging.

This is one of the mildest of the mercurials; resembling blue pill in composition and action, but being weaker than it. Eight grains contain three of mercury. Like blue pill, it exerts its action on the upper part of the intestinal canal, and promotes, by continuous sympathy, the

secretion from the liver ; the chalk acting at the same time as an antacid. It is often administered as a eutrophic in syphilitic affections of childhood ; in enlargement of the mesenteric glands ; and in all chronic affections, in which a mercurial eutrophic may be needed.

The dose is from gr. v to 3ss at night, or night and morning, in any thick vehicle. The usual dose to children is gr. iij to gr. v.

The Dublin Pharmacopœia has *HYDRARGYRUM CUM MAGNESIA*, which is prepared by rubbing *mercury* and *manna*, of each two parts, and *carbonate of magnesia*, one part, together ; until the globules disappear. It is employed in similar cases with *Hydrargyrum cum Cretâ*. It is not officinal in the Pharmacopœia of the United States.

3. PIL'ULÆ HYDRAR'GYRI.—MERCURIAL PILLS.

The mode of forming these pills, and their properties as cathartics, have been described elsewhere, (Vol. i. p. 188.) It was there stated, that a portion of the mercury probably experiences oxidation ; and that the therapeutical effects may be dependent upon the oxide.

When employed to induce the eutrophic effects of mercury, five or ten grains may be given night and morning ; and be repeated until the mouth exhibits its agency. Should it run off by the bowels, a small quantity of opium—say one-fourth of a grain—may be added to each dose. Suspended by means of mucilage, it was formerly recommended by Plenck, and the mixture was called, after him, *Plenck's solution*. It was prescribed by him as an anti-syphilitic.

4. UNGUEN'TUM HYDRAR'GYRI.—MERCURIAL OINTMENT.

(*Hydrargyr. ℥ij ; Adipis ʒxxij ; Sevi ʒj* ; rubbed until the globules disappear.) The remarks, made on the composition of the preparations last mentioned, are equally applicable to this ; which is also called *Blue Ointment*, *Blue Unguent*, *Uncion*. When properly prepared, it is of a bluish gray colour, becoming darker by age, and should afford no traces of globules when rubbed on paper. It contains half its weight of mercury, but is said to be frequently prepared with a smaller quantity of the metal ; and in order to communicate to it the requisite shade of colour, sulphuret of antimony, indigo, or Prussian blue is sometimes intermixed. Occasionally, too, a little sulphur is added, by which the extinction of the metal is facilitated. In such cases, the ointment is blacker than it ought to be ; and the smell of sulphur is apparent.

Mercurial ointment has been given internally, in the form of pill ; but it possesses no virtues over mercurial pill, and is, of course, a more objectionable form for internal administration. It is, therefore, rarely employed in this country. It is applied by friction, either alone, or associated with some mercurial, when the object is to affect the system. With this view, a drachm may be rubbed in on the inside of the thigh or arm, for fifteen minutes, night and morning. Where the object is to affect the system speedily, it may be applied to blistered surfaces, or be

placed, in addition, in the axillæ. When practicable, the friction should be made by the patient himself; but if this should not be convenient, or desirable, the attendant may cover his fingers or hands with oiled bladder, to prevent himself from becoming affected by the mercurial. Occasionally, a troublesome eruption is brought out by the friction. This soon, however, passes away, and in the mean time a fresh surface may be chosen.

Mercurial ointment is employed as a dressing to syphilitic ulcers, and is rubbed on various morbid growths to facilitate their absorption.

A COMPOUND LINIMENT OF MERCURY, LINIMENTUM HYDRARGYRI COMPOSITUM, is in the London Pharmacopœia. It is made of *Mercurial ointment* and *Lard* of each $\mathfrak{z}\text{iv}$; *Camphor* $\mathfrak{z}\text{j}$; *Alcohol* $\mathfrak{f}\mathfrak{z}\text{j}$; *Solution of ammonia* $\mathfrak{f}\mathfrak{z}\text{iv}$. The camphor being first rubbed with the spirit, and then with the lard and ointment of mercury, the solution of ammonia is added, and the whole is well mixed together. It has been affirmed, that it induces ptyalism more readily than common mercurial ointment, owing to the presence of the camphor and ammonia; but it is rarely used for this purpose. It is more frequently employed as a discutient to tumours; and in chronic affections of the joints.

5. EMPLASTRUM HYDRARGYRI.—MERCURIAL PLASTER.

(*Hydrarg.* $\mathfrak{z}\text{vj}$; *Ol. oliv.*, *Resin.* $\text{āā } \mathfrak{z}\text{ij}$; *Emplastr. Plumbi*, $\mathfrak{ss}\text{j}$. The oil and resin are melted, and, when cool, are rubbed with the mercury until the globules are extinguished; the melted lead plaster is then added.)

Mercurial plaster in its chemical composition is situate like the last article. The London College adds a little sulphur to facilitate the extinction of the metal; but the composition becomes, of course, changed by it.

Spread upon leather, this plaster is applied as a discutient to syphilitic and other tumours; especially to buboes. It is also applied over the abdomen in cases of disease of any of the organs of that cavity, particularly in chronic hepatitis. In rare cases, the mercury is absorbed; and ptyalism has resulted from it.

A PLASTER of AMMONIACUM WITH MERCURY is officinal in the British Pharmacopœias. It is used in similar cases.

6. HYDRARGYRI OXIDUM NIGRUM.—BLACK OXIDE OF MERCURY.

The mode of forming this preparation has been referred to elsewhere, (Vol. i. p. 189.) When newly prepared, it is black, or nearly so; but, as met with in the shops, having been exposed to light, it is generally olive-coloured; being partly resolved into metallic mercury and peroxide. It is wholly dissipated by a strong heat, and metallic globules are sublimed.

Black oxide of mercury is rarely prescribed internally; nor is it well adapted for internal use, by reason of its uncertain composition. Hence,

it has been expunged from the Edinburgh Pharmacopœia: It is capable, however, of exciting the ordinary eutrophic effects of mercury, when given in the dose of one grain to three, two or three times a day. An ointment is sometimes prepared of it, (*Hydrarg. oxid. nigr. p. i. ; Adipis p. iij. ;*) which may be used in the same cases as *Unguentum Hydrargyri*. It is a better preparation as a fumigating agent to syphilitic ulcers than the sulphuret, which is more frequently, however, employed, in consequence of sulphurous acid being formed when the sulphuret is used ; which may be irritating. To induce salivation, it was employed by Mr. Abernethy in the following manner. Place the patient in a vapour bath, in a complete suit of under garments, with a cloth around his chin. Two drachms of the oxide are then put on a heated iron within the machine in which the patient is sitting. After continuing the bath for about fifteen or twenty minutes, the body is found covered with a whitish powder. The patient should now be placed in bed ; lie in the same clothes till morning, and then go into a tepid bath. Mr. Abernethy affirms, that in this manner he has known salivation produced in forty-eight hours.

It is the basis of the well-known BLACK WASH, (*Hydrarg. chlorid. mit. ʒss ; Liquor. calcis Oss.*) In this case, the black oxide is precipitated ; and chloride of calcium remains dissolved. It is much used as a wash for syphilitic sores.

7. HYDRARGYRI OXIDUM RUBRUM.—RED OXIDE OF MERCURY.

Red oxide, Binoxide, Deutoxide, Peroxide of mercury, Red precipitate, is prepared by dissolving *mercury*, with a gentle *heat*, in *nitric acid* previously mixed with water, and evaporating it to dryness. The mass is then rubbed into powder, and heated in a very shallow vessel, till red vapours cease to arise. The dry mass, first obtained, is nitrate of peroxide of mercury, the nitric acid of which is decomposed and driven off by the heat ; and by continuing the process till ruddy fumes of nitrous acid cease to be disengaged, the red oxide is obtained pure. It is in orange-red crystalline scales, which are wholly soluble in chlorohydric acid. On the application of heat, it yields oxygen ; and the mercury either runs into globules or is wholly dissipated.

Red oxide of mercury is so powerful an irritant, and so harsh and uncertain in its action, that it is very rarely prescribed internally. It has been used as a eutrophic in syphilitic cases, in the dose of from a quarter of a grain to a grain, associated or not with opium. Externally, it is applied in the form of powder, in syphilitic and other sluggish ulcers ; or made into an ointment. It is the basis of the YELLOW WASH, *Phagedenic wash*, much used in syphilitic and sluggish ulcers, and applied by means of lint wetted with it. (*Hydrarg. chlorid. corrosiv. gr. xv ; Liquor. calcis Oss.*)

The red oxide is occasionally used to destroy pediculi.

UNGUENTUM HYDRARGYRI OXIDI RUBRI. OINTMENT OF RED OXIDE OF MERCURY. (*Hydrarg. oxide. rubr., in pulv. subtiliss. ʒj ; Unguent. simpl.*

3viiij.) This ointment undergoes a change of colour and character by being kept; its beautiful red colour is changed to a black, owing to the deoxidation of the red oxide of mercury. It is a common application to syphilitic and other indolent sores, in which it appears to act simply by its excitant properties. It is likewise used as an excitant in ophthalmia tarsi; and may be employed at night by means of a camel's hair pencil. The gluing together of the tarsal edges of the eyelids is, in this way, prevented. It is, likewise, much used in porrigo, and other chronic cutaneous eruptions.

Red oxide of mercury is used in the preparation of *Hydrargyri Cyanuretum* of the Pharmacopœia of the United States.

8. HYDRARGYRI CHLORIDUM MITE.—MILD CHLORIDE OF MERCURY.

Mild chloride of mercury or calomel—whose general properties are described elsewhere, (Vol. i. p. 186,)—is capable of exerting all the effects of the mercurials, and is more used in this country for that purpose than any other preparation. It is astonishing, indeed, how much of this agent has been given almost, if not altogether, empirically in formidable diseases, as in cholera. It would seem to exert no irritating agency in enormous doses; for where an ounce was taken by mistake, the only effects were slight nausea and faintness, and neither salivation nor any approximation to it followed. It has been administered in three drachm doses, often repeated; and has appeared, in such quantities, to be sedative rather than irritant. It is a common idea, that these huge doses have only been given in the western and southern parts of the United States; but such is not the fact. "I have now before me," says Dr. Pereira, "reports of eighteen cases of spasmodic cholera, admitted in the year 1832, into the Cholera Hospital at Bethnal Green, in this metropolis, (London,) in which enormous quantities of calomel were employed by the house-surgeon, Mr. Charles Bennett, (formerly one of my pupils,) with very slight physiological effects. When a patient was brought into the hospital, two drachms of calomel were immediately given, and afterwards one drachm, every one or two hours until some effect was produced. In 17 out of 18 cases in which this plan was tried, the vomiting and purging diminished, and the patients recovered. Several of them took from 20 to 30 drachms without the subsequent ptyalism being at all excessive. In one case (a female, aged 36 years,) 30½ drachms were administered within forty-eight hours; moderate ptyalism took place and recovery. In the unsuccessful case, which I have alluded to, 53 drachms of calomel were administered within forty-two hours, without the least sensible effect."

As a gentle eutrophic, calomel is prescribed in very small doses, half a grain for example, night and morning, in diseases of the glandular system; and in chronic cutaneous and other affections, that demand an alterative agency. It is likewise given in small doses, like blue pill, followed by a cathartic, in hepatic diseases; in which it probably operates, by revulsion, in two modes; *first*, through its peculiar excitant agency on the lining membrane of the stomach and duodenum; (see Vol. i. p.

186;) and *secondly*, through its insensible action on the secretory system in general. When prescribed even in the small doses above mentioned, it speedily produces its peculiar effects on the system. To accomplish this, however, it is generally associated with opium, to prevent its affecting the bowels. The following form is often employed by the author in syphilis;—*Hydrarg. chlorid. mit.* gr. vj; *Pulv. opii* gr. iij; *Cretæ præparat.* ʒj; *Confect. ros.* q. s. ut fiant pilulæ xij. Dose, one night and morning, until the mouth is slightly affected. Occasionally, however, it is given much more freely and more frequently; where the desire is to produce speedily full ptyalism; but the author has generally found, that small quantities given at long intervals—not less than four or five hours—touched the mouth sooner than when it was administered oftener; and to a greater extent. It has been maintained, indeed, by one observer, that when given every three or four hours, in doses of five or six grains, it is exceedingly difficult to salivate with it; as the mercury passes off rapidly by the skin.

Calomel is sometimes used as a local application, being suspended in mucilage, and employed as a gargle in syphilitic sore throat; but more frequently used in the form of ointment in syphilitic sores; and likewise as a local application, to induce a new action in various chronic cutaneous diseases. Dr. Pereira states, that were he required to name a local agent pre-eminently useful in skin diseases generally, he would fix on this;—*Hydrarg. chlorid. mit.* ʒj; *Adipis* ʒj. It certainly is a good application in these cases; but the author has not been led to estimate it so highly.

9. HYDRARGYRI CHLORIDUM CORROSIVUM.—CORROSIVE CHLORIDE OF MERCURY.

Corrosive Chloride, Corrosive muriate, Bichloride, Muriate or Oxymuriate of mercury, Corrosive sublimate, is made by boiling *Mercury* with *Sulphuric acid*, until the sulphate of mercury is left dry. When cold this is rubbed with *chloride of sodium*, and sublimed. In this process, double decomposition occurs,—the products being bichloride of mercury which sublimes, and sulphate of soda which remains behind.

As usually met with, it is in colourless crystals, or crystalline masses, which sublime without leaving any residue; and are entirely soluble in water, alcohol and ether. Its solubility in water is variously stated. It requires, however, about three times its weight of boiling water, and eighteen or twenty times its weight of cold water. Its solubility is increased by the acids, especially the chlorohydric; and by the alkaline chlorides; hence, muriate of ammonia is occasionally added to lotions of which it forms part.

Corrosive chloride of mercury is a most virulent corrosive poison, acting as a powerful caustic by reason of its affinity for the albuminous and other constituents of animal matters. In smaller doses, it is employed therapeutically as a eutrophic; and in syphilitic diseases is preferred by some—exerting often a beneficial effect upon them, without salivation or any other disagreeable result. Occasionally, indeed, it

irritates the gastro enteric organs, producing nausea, tormina and purging ; but this may generally be obviated by administering it carefully, or by combining it with opium. It is less likely to produce salivation than any other mercurial ; and this is one cause of its being so extensively employed in syphilis,—concealment being important, and salivation leading to strong suspicion of the nature of the affection, for which it has been prescribed.

It may be given in every stage of syphilis, but has had more reputation in the secondary form, and especially in chronic cutaneous affections of a venereal kind. In such cases, it may be prescribed either in the form of pill made with crumb of bread, or in solution,—from 1-16th to 1-12th of a grain for a dose, repeated three or four times a day, and taken on a full stomach ; or in the form of the officinal solution given below. It is frequently combined with sarsaparilla, and other vegetable eutrophics, not only in syphilitic affections, but in rheumatic and neuralgic conditions, and in chronic cutaneous diseases in general ; and it certainly often succeeds in modifying the morbid state of the nutritive actions of the part, after they have resisted other remedies. Externally, it is used occasionally as a gargle in venereal sore throat ; as a wash to syphilitic ulcers ; and in different chronic cutaneous diseases ; as well as in ophthalmia of a venereal nature. The strength of the lotions may vary from half a grain to two or three grains to the fluidounce. It may be applied to the throat by means of a camel's hair pencil.

10. HYDRARGYRUM AMMONIATUM.—AMMONIATED MERCURY.

Ammoniated mercury, ammonio-chloride of mercury, muriate of ammonia and mercury, cosmetic mercury—more commonly known under the names, *white precipitate of mercury, white precipitate*—is prepared by dissolving *corrosive chloride of mercury* in *distilled water*, with the aid of heat ; and, when the solution is cold, adding *solution of ammonia*. The precipitate—when washed till it is tasteless, and dried—is ammoniated mercury.

As met with in the shops, it is in powder or in pulverulent masses, of a white colour ; without smell, and of a taste which is at first earthy, and afterwards metallic. It is insoluble in water and alcohol.

Ammoniated mercury is never used at the present day internally. In the form of ointment, it is applied to chronic cutaneous eruptions ; and as an excitant to ulcers, especially when of a syphilitic character. Either in the form of an ointment, or rubbed up with hair powder, in the proportion of one part of the ammoniated mercury to four parts of powdered starch, it is used to destroy pediculi.

UNGUENTUM HYDRARGYRI AMMONIATI, OINTMENT OF AMMONIATED MERCURY.
(*Hydrarg. ammoniat. ʒj; Unguent. simpl. ʒiiss.*) Used in the cases just mentioned.

11. HYDRARGYRI IODIDUM.—IODIDE OF MERCURY.

Iodide, Protiodide or Subiodide of mercury, is made by rubbing *mercury* and *iodine* together in certain proportions, with sufficient *alcohol* to form a paste; and continuing the trituration until the globules disappear. The iodide is then dried in the dark, with a gentle heat; and kept in a well stopped bottle, whence the light is excluded. The mercury, in this process, combines with the iodine, and the combination is facilitated by the alcohol, which dissolves a part of the iodine, and forms the remainder into a paste.

It is a greenish-yellow powder, which is insoluble in water or alcohol, but is soluble in ether, and slightly so in a watery solution of iodide of potassium.

It is a powerful irritant poison; but in small therapeutical doses is capable of exciting the ordinary alterative and sialogogue effects of the mercurials. By some, it has been supposed to be especially efficacious in cases in which there is a union of scrofula and syphilis; but, according to Dr. Christison, "all hitherto positively known relative to these notions is, that iodide of mercury is capable of producing the physiological effects of mercurials. It has been given in syphilis and in scrofula, and especially when occurring together; and in chronic cutaneous affections of various kinds." It is not, perhaps, so often used in this country as the red iodide.

The London Pharmacopœia contains two preparations,—*PILULÆ HYDRARGYRI IODIDI*; (*Hydrarg. ioidid.* ℥j; *Confect. rosæ canin.* ℥iij; *Zingib. pulv.* ℥j. Five grains contain one of iodide;) and *UNGUENTUM HYDRARGYRI IODIDI*; (*Hydrarg. ioidid.* ℥j; *Ceræ albæ* ℥ij; *Adipis* ℥vj,) which is employed as a dressing for scrofulous ulcers, or for syphilitic ulcers in scrofulous individuals; and likewise as an application in lupus, and other congenerous affections of the skin.

The dose of iodide of mercury is a grain, which may be gradually carried to three or four.

12. HYDRARGYRI IODIDUM RUBRUM.—RED IODIDE OF MERCURY.

Red iodide, Biniiodide, Deutiodide or Periodide of mercury, is made by dissolving *corrosive chloride of mercury*, and *iodide of potassium*, in proper proportions, in water; mixing the solutions; collecting the precipitate on a filter, and, having washed it with distilled water, drying it with a moderate heat, and keeping it in a well stopped bottle. In this process, chloride of potassium remains in solution; and the red iodide is precipitated.

It is of a beautiful scarlet red colour; is insoluble in water, and sparingly soluble in alcohol, but very much so in certain saline solutions, of which those of iodide of potassium, and corrosive chloride of mercury are most remarkable. With other alkaline iodides—as iodide of potassium—it forms a class of double salts, called *hydrargyro-iodides*, or *iodo-hydrargyrates*.

In its therapeutical effects, this preparation resembles corrosive chloride of mercury, whilst the iodide resembles calomel. It may be given in the same cases as the iodide, but requires great caution in its administration. The author has frequently administered the red iodide in public and in private practice, in cases where an active modifier of the function of nutrition appeared to be demanded, and where a combination of the potent remedies—mercury and iodine—suggested itself. In chronic glandular enlargements, especially of the liver and spleen, and in habits where the use of mercury was not contra-indicated, both it and the iodide have proved serviceable. Perhaps there are no preparations, which, under the circumstances in question, merit more attention. It readily excites ptyalism. *read*

It may be given internally in the dose of one-sixteenth gradually increased to one-fourth of a grain, in the form of pill; or it may be dissolved in alcohol, (*Hydrarg. ioidid. rubr.* ℥j; *Alcohol.* ℥iss. Dose, ten to twenty drops;) or in ether, (*Hydrarg. ioidid. rubr.* ℥j; *Æther. sulphuric.* f.℥iss. Dose, ten to twenty drops.) *m*

In the form of ointment, it has been found very efficacious in scrofulo-venereal ulcers, syphilitic swellings of the lymphatic glands; scabies; carcinomatous ulcerations; goître, condylomata, &c. The London Pharmacopœia has UNGUENTUM HYDRARGYRI BINIODIDI, (*Hydrarg. ioidid. rubr.* ℥j; *Ceræ flavæ* ℥ij; *Adipis* ℥vj.) the strength of which requires to be reduced, when applied to delicate parts, or to painful ulcerations.

13. POTASSII IODO-HYDRARGYRAS.—IODO-HYDRARGYRATE OF POTASSIUM.

Iodo-hydrargyrate of potassium, Hydrargyro-iodide of potassium, Iodo-hydrargyrate of Ioduret of potassium, Hydrargyro-iodide of potassium, may be made for medical use in the following manner—*Hydrarg. ioidid. rubr.* gr. iv; *Potassii ioidid.* ℥j; *Aquæ destillat.* f.℥j. Dose, five drops, three times a day. By the union of the two iodides, a soluble double salt is formed, in which red iodide of mercury acts the part of an acid, and iodide of potassium that of a base.

It does not appear, that this preparation possesses any essential, or, indeed, any advantage over the iodides of mercury; and accordingly it is not much used. It may be prescribed in the same cases.

14. HYDRARGYRI SULPHURETUM NIGRUM.—BLACK SULPHURET OF MERCURY.

Black sulphuret of mercury, Sulphuret of mercury with sulphur, Æthiop's mineral, is made by rubbing together equal quantities of mercury and sulphur till the globules disappear. It is a black, tasteless powder; devoid of smell, and insoluble in water. It is wholly dissipated by heat. *read*

Black sulphuret of mercury is a feeble mercurial, and is rarely administered so as to affect the system with mercury. It has been given,

indeed, in considerable doses, and for a great length of time, with scarcely any effect. When prescribed at all, it is generally in the glandular affections of children; and in chronic cutaneous diseases, especially in scabies, in which the sulphur is probably the most active ingredient. Its dose is from gr. v to ʒss repeated two or three times a day.

15. HYDRAR/GYRI SULPHURE/TUM RUBRUM.—RED SULPH/URET OF MER/CURY.

Red sulphuret or Bisulphuret of mercury, Cinnabar or Vermilion, is made by mixing *mercury* with melted *sulphur*, in due proportions, over the fire; rubbing the mass, when it begins to swell, into powder; and subliming. By the agency of heat, the mercury and sulphur unite and form black sulphuret; which is converted by sublimation into red sulphuret.

Cinnabar occurs in nature, but is never used for therapeutical purposes. That of the shops is always prepared in the mode above-mentioned. It is met with in two forms,—in mass, when it is a ponderous dark brownish-red substance of metallic brilliancy, very friable, and leaving a vermilion streak when scratched with the nail,—and in powder, when it is likewise heavy, and of a well known red colour. It is devoid of taste and smell, and is entirely volatilized by heat.

Red sulphuret of mercury may be used in the same cases as black sulphuret, but it is rarely given internally. It is most commonly employed as a fumigating agent in syphilitic affections of the throat. Half a drachm may be thrown upon a hot plate, and be received into the fauces by breathing over it. In this manner it not only produces local excitations; but salivation where it is desirable that this should be caused speedily. Ptyalism, thus induced, has at times been so violent, that the remedy is rarely used. The sulphurous vapour, too, is so irritating, as to be improper for those of weak lungs; and the black oxide is preferred where fumigations are considered to be advisable.

Should it be desired to give it internally; from ten grains to half a drachm may be prescribed.

16. HYDRAR/GYRI CYANURE/TUM.—CYAN/URET OF MER/CURY.

Cyanuret of mercury, Bicyanide or Prussiate of mercury, is prepared by boiling together *ferrocyanuret of iron*, *red oxide of mercury*, and *distilled water*, in proper proportions, for half an hour; and filtering. The residue is washed with distilled water, and again filtered. The solutions are then mixed, and evaporated, so that crystals may form. These may be purified by solution and recrystallization. In this process, the cyanogen of the ferrocyanuret of iron combines with the mercury of the red oxide; and the iron unites with the oxygen of the oxide.

Cyanuret of mercury is in transparent crystals, which are square prisms, and wholly soluble in water, but very little so in alcohol. They are devoid of smell, but have a strong metallic taste.

This preparation has been used as an antisyphilitic, and by some is preferred to the corrosive chloride, in consequence of its greater solubility, and the capability of more speedily affecting the system by it. It is said to be liable to excite vomiting; and, therefore, it is advisable, that a small quantity of opium or a few drops of laudanum should be added to each dose. Some, however, have not deposed favourably in regard to it; whence it has been inferred, that there must be some uncertainty in its preparation. It has been used externally in the form of ointment, (*Hydrarg. cyanuret.* gr. xij; *Adipis* ℥j;) in chronic cutaneous affections, and in syphilitic ulcerations; and has been employed as a gargle in syphilitic sore throat. (*Hydrarg. cyanur.* ℥ss; *Decoct. sem. lini* Oj.)

The dose is one-sixteenth of a grain, gradually increased to half a grain, three or four times a day; made into a pill with crumb of bread; or, it may be given in solution. The *Liqueur antisyphilitique* of Chaussier is made as follows:—*Hydrargyr. cyanuret.* gr. viij; *Aquæ destillat.* Oj. Each fluidounce contains half a grain of the cyanuret.

17. UNGUENTUM HYDRARGYRI NITRATIS.—OINTMENT OF NITRATE OF MERCURY.

Ointment of nitrate of mercury, Citrine ointment, is formed as follows:—*Hydrarg.* ℥j; *Acid. nitric.* f.℥xj; *Ol. bubuli* f.℥ix; *Adipis* ℥iij. The mercury is dissolved in the acid; and to the melted lard and oil the solution is added. This ointment is said to have been proposed originally as an imitation of a nostrum well known by the name of *Golden eye-ointment*.

When freshly prepared, this ointment has a beautiful golden yellow colour; a soft consistence, and a nitrous odour; but in process of time it acquires a dirty greenish hue, and becomes so hard as to be unfit for use, unless mixed with lard. This appears to be owing to the hardening of the olive oil by the nitrate of mercury. To diminish this objection, neat's foot oil is substituted in the Pharmacopœia of the United States with advantage. Dr. Wood, of Philadelphia, states, that he had in his possession for more than a year a pot of ointment, made according to the above process, and although it had partially assumed a greenish colour, it preserved a uniform, soft, unctuous consistence. It ought not to be stirred with an iron spatula, or be brought into contact with iron in any manner; as the iron will be corroded, and the ointment be discoloured.

Ointment of nitrate of mercury is a valuable application in many chronic cutaneous diseases,—as lupus, porrigo, herpes, psoriasis, impetigo, lepra, &c. It is frequently, also, used in cases of ophthalmia tarsi, applied by means of a camel's hair pencil; and is spread upon lint as an application to syphilitic and other foul and phagedenic ulcers. Except in the last cases, however, the ointment generally requires to be reduced with at least one or two parts of lard.

18. HYDRARGYRI SULPHAS FLAVUS.—YELLOW SULPHATE OF MERCURY.

This preparation—the general properties of which have been described elsewhere, (Vol. i. p. 123,)—has been given as an alterative mercurial in chronic cutaneous affections; and in syphilis, to produce the specific effects of mercury; but it is at times harsh in its operation. It is now, therefore, almost abandoned; and has been pronounced by Dr. Christison an unnecessary mercurial; and one that may be expunged from the Pharmacopœias without inconvenience.

The dose, as a eutrophic, is from a quarter to half a grain; made into a pill with crumb of bread.

IODINI PRÆPARATA.—PREPARATIONS OF IODINE.

19. IODINUM.—IODINE.

This article constitutes one of the most important gifts from chemistry to therapeutics. It was totally unknown until 1812; when M. Courtois, a manufacturer of saltpetre, discovered it; but it was mainly through the labours of Gay-Lussac and Sir Humphry Davy, that its chemical relations were duly appreciated. Since then, it has been found to be very largely distributed in nature; having been discovered in a great number of vegetables belonging to the family Algæ; in many marine mollusca, in sea-water, and in several mineral-waters. In Great Britain, it is said to be exclusively manufactured at Glasgow, from the kelp of the west coast of Ireland, and the Western Islands of Scotland. (Pereira.) According to Dr. Traill, the greatest quantity is produced by kelp made from *drift weed*, which is in a great measure composed of *Fucus digitatus*, and *F. Loreus*,—*Cutweed*, which consists of *F. vesiculosus* and *F. serratus*, yielding much less of it. One hundred tons of Caithness kelp, furnish, according to the experience of a manufacturer, 1000 pounds of iodine, or about a 224th part. (Christison.) It is always prepared on a large scale; and hence is placed in the Materia Medica list of the Pharmacopœia of the United States. It is procured from the mother-water of soda derived from sea-plants, by different processes in different manufactories. A certain portion of it is readily obtained by heating the liquid with sulphuric acid, which decomposes the iodide of the alkali; and violet fumes of iodine are disengaged, which may be condensed in a receiver. For the process the reader is referred to the various works on chemistry.

Iodine is in crystalline scales; of a bluish-black colour, and metallic lustre. When heated it melts, and is volatilized in purple vapour; whence its name—from *ιωδης* “blue.” It is wholly soluble in alcohol and in ether; and is very slightly soluble in water, requiring 7000 parts of that fluid. Its great characteristic property is the production of a blue colour when it meets with starch. In consequence of its high price, it is very liable to adulteration; and it is said, that coal, black lead, oxide of manganese and charcoal have been added to it; but neither

Dr. Christison nor Dr. Pereira has met with any of these impurities, which remain behind when heat is applied, and admit, therefore, of easy detection. Water is the chief adulterant; and its unusual presence may be suspected, if the iodine adheres to the sides of the bottle in which it is kept. Dr. Christison states, that until within the last eighteen months, he has not met with any British iodine that has not contained between 15 and 20 per cent. of water. From July 1848 to April 1849 inclusive, Dr. Bailey, inspector of drugs at the port of New York, had to reject 3775 oz. of iodine from London, and 1280 oz. from Glasgow. The smell of iodine is similar to that of chlorine, with which it accords in its property of destroying vegetable colours. It stains the skin yellow, but the stain gradually disappears.

In regard to the effects of iodine on the economy, discrepancy exists amongst observers; although great care appears to have been taken in the experiments. Those of MM. Magendie and Orfila would seem to show it to be an irritant to man in moderate doses; but, on the other hand, Dr. Gully affirms, that he gave as much as f.ʒiij of the tincture daily, and did not observe any effect; and Dr. Kennedy, of Glasgow, gave 953 grains in the form of tincture within eighty days, without the health of the patient—a girl—seeming to be affected by it. It is certainly, however, an irritant when applied topically; staining the surface yellow, as before remarked, and causing rubefaction, itching and desquamation. When inhaled, it acts as an excitant expectorant. (See Vol. i. p. 258.)

Like eutrophics in general, it passes into the mass of blood, and exerts its action on the tissues by the modifications induced by it in that fluid. That it is received into the blood admits of positive proof. It has been detected in the urine, sweat, saliva, milk and blood; and in every case, was found in the state of iodide; so that M. Cantu infers its action on the body to be chemical by abstracting hydrogen. Two drachms, according to Dr. Buchanan, were given to a young man labouring under blennorrhœa, and as soon as the medicine made its appearance in the urine, blood was drawn from the arm. On examining it, both the serum and the crassamentum were found deeply impregnated with iodine. The same quantity was given to a boy affected with dropsy of the knee-joint. About five hours after it had been taken, a very small puncture was made, and upwards of twelve ounces were drawn off by a cupping-glass. The fluid contained iodine in abundance. To an old man, who had a very large hydrocele, two drachms of iodide of potassium were given over night; and the same quantity the following morning. On tapping him, some hours after he had taken the last dose, more than thirty ounces of serum were drawn off, containing a large quantity of iodine. It has been found in the liquor amnii of a female during parturition, who, for four months previously, had taken iodide of potassium; and Landerer detected it in the testicle of a man to whom he had administered it.

When iodine is continued for a length of time, it is said to produce a train of phenomena indicating its injurious action on the organism, to which the terms *iodosis*, *iodinia*, and *iodism* have been applied. Ob-

servers have not agreed as to the precise phenomena that characterize this condition ; but most of them mention irregularity in the functions of the digestive organs ; at times, diarrhœa ; at others, constipation ; gastrodynia ; violent vomiting ; excessive emaciation ; anxiety ; depression of spirits, and symptoms similar to those of hypochondriasis ; obscurity of vision ; hardness of hearing ; palpitations ; tremors ; absorption of the mammæ of the female, and of the testes in the male ;—yet Dr. Buchanan affirms, that although he has given iodine very largely, he has never seen any of the unpleasant results that have been ascribed to it. He asserts, that he has never seen its use “ followed by wasting of the testes or mammæ ; by palpitations ; faintness ; excessive debility ; hurried, anxious breathing ; dinginess of the surface ; copious clammy sweats ; increased menstrual discharge, or an oily appearance of the urine, which are enumerated amongst the symptoms characterizing the supposed affection, termed iodism.” From the testimony, however, of observers of eminence, we can scarcely doubt, that such an affection may be induced, and become dangerous to life ; yet it must be rare ; for although the author has administered iodine very freely, he has seldom seen symptoms ensue, which he was disposed to refer to it ; except such as so nauseous an article was likely to cause in the stomach. As respects the wasting of the mammæ and the testes, it must be unfrequent. Neither Magendie nor Pereira nor Ricord nor Kluge—the two last of whom have given it very largely in the hospitals of Paris and Vienna—has seen it ; but Magendie remarks, that it is common in Switzerland. The author’s own experience coincides with that of the first named gentlemen. He has prescribed it, and seen it prescribed largely, both in public and private ; yet no such result has supervened in a single instance. M. Lugol, indeed, asserts, that his emaciated patients became fatter under its use ; and MM. Coindet and Formey found it increase the appetite. Ulceration of the mouth, and salivation, are said to have been produced by it.

As a valuable eutrophic, iodine exerts its power in various diseases,—not only when given in its pure state, but in its combination with the alkalies—especially the iodide, and the ioduretted iodide of potassium. The therapeutical remarks that apply to the one, are equally applicable, therefore, to the others.

Perhaps in no disease have its virtues been more marked than in goître, in which it has been more successful than any other remedy. In another work, the author has referred to many individuals who have deposed to the valuable services it has rendered ; and it may be added, that Mr. Bramley, whilst in Nepal, amongst the Himalaya mountains, and under unfavourable circumstances, cured 57 out of 116 cases, and brought 34 more into a fair way towards ultimate recovery. (Christison.) The author has succeeded in every case of soft goître in which he has prescribed it : in two or three, the hypertrophy returned, but it was again dispersed under the use of the remedy. When the tumour has acquired a cartilaginous hardness, although it may be diminished under the use of iodine, it can rarely or never be wholly removed ; but under such circumstances, every other remedy would be found equally fruitless. Generally, it exhibits its effects in three weeks ; but, at times,

not until it has been persevered in for four or five ; after which the improvement is often signal. It may be given either in the form of the tincture, or of Lugol's solution ; and may be rubbed on the part at the same time ; but the author has always found the tincture sufficient. It has been advised by some, that bleeding should be practised ; and if little or no effect appears to be produced by the iodine, this may be desirable with the view of facilitating absorption ; but it is not usually necessary. It is worthy of recollection, that burnt sponge was long celebrated for its powers over goitre, before iodine was discovered ; and the same was the fact in regard to certain brine springs—as that of Salzhhausen.

In the enlargement of other glandiform bodies,—for example, of the spleen and mesenteric ganglions ; as well as of different glands, as the liver, mammæ, testes, submaxillary gland, &c., iodine has been used freely ; and although the benefits derivable from it are not as marked as in goitre, they have often been considerable.

In scrofulosis, it has attained great celebrity. Whilst mercury has been esteemed, by some, the great remedy for syphilis, they have equally given the preference to iodine in scrofula ; and, in many forms of this cachexia, it is often very successful ; but it requires to be persevered in for a considerable time. It has been equally celebrated in the constitutional forms of syphilis ; and in mercurial cachexia ; in which cases iodide of potassium, in large doses, is usually preferred. In tuberculous cachexia, it has had testimonials in its favour ; but, like every other remedy, it must generally fail in that intractable condition, especially as we meet with it in tubercular phthisis. In such cases, it has been not only given internally, but has been inhaled in the manner described elsewhere, (see Vol. i. p. 258) ; but, as the author has remarked, his experience has not been favourable to it. It has likewise been given largely in cancerous cachexia, and especially in cancer of the uterus ; but although its revulsive influence has seemed, occasionally, to check the disease for a time, it has almost always—if not always—recurred. In dropsy, it has been often given in consequence of its manifest influence, in many cases, in modifying nutrition, and thereby occasioning absorption. It would seem to be especially indicated in cases of dropsy that are dependent upon induration or other organic disease of some viscus, as of the liver. Some have affirmed it to be an excellent antihydrotic in every form of the disease—hydrothorax, ascites, hydrocele, hydrocephalus—acute or chronic, hygroma, &c., administered internally or applied externally. Of its utility in nervous diseases, testimony is somewhat discordant ; but in almost every form of cutaneous affection, it has been highly extolled by many ; and spoken doubtfully of by some. In these cases, the internal should be associated with the external use. The iodine, by passing into the capillaries, and modifying the condition of the circulating fluid, impresses their sensibilities differently ; so that a new action is often induced in them ; and the result is favoured by the new impression made by the external application of an ointment, or a solution of iodine, to the parts affected.

Iodine has likewise been given in several affections which it is difficult to classify—as in the advanced stage of pneumonia, in inconti-

nence of urine, leucorrhœa, discharges from the nose, scorbutic states of the gums, mercurial salivation, stricture of the œsophagus, affections of the mucous membrane of the middle ear, scleritis, iritis, sclero-iritis, and corneitis, chronic inflammation of the lachrymal gland, impotence;—and as an efficacious remedy in checking or controlling the ulcerative process,—the most active phagedenic ulcers often yielding in a surprising manner to its influence, and assuming a healthy, granulating appearance.

Iodide of potassium, in large doses and long continued, has appeared to exhibit power over acute, and especially over chronic rheumatism; and it has been occasionally used with success in tophaceous and other articular enlargements occurring in gout:—but it is difficult to enumerate the various heterogeneous cases in which iodine and its preparations have been prescribed. (For details see *New Remedies*, 5th edit. p. 399, Philad. 1846.)

As a local application, iodine is a useful agent in many diseases. In cutaneous affections of various kinds, the tincture, applied pure or diluted—as the case may require—has been of eminent service, as in lupus, porrigo, impetigo, &c.; and it has been advised in various diseases, to fulfil the same objects as nitrate of silver. For example, it has been painted over the part with a camel's hair pencil, dipped in the tincture, in erysipelas; phlegmon; sloughing of the cellular membrane after phlegmonous erysipelas; acute inflammation; anomalous pains; chronic inflammation and enlargement of the joints; inflammation of the absorbents; anthrax; boils; buboes; malignant ulcers of the tongue and tonsils; scrofulous swelling of the glands; chilblains; lacerated, contused, and punctured wounds; burns and scalds; gouty and rheumatic swellings; fistulous openings; malignant or adventitious excrescences; stings of wasps; disease of the spine; ununited fractures; orchitis; chronic ophthalmia; opacities of the cornea; dissection wounds; as an ectrotic to variolous pustules to prevent pitting, &c.—in many of which affections it doubtless acts as an ordinary excitant; and the same may be said of it as an injection in hydrocele, and other forms of dropsy, in which the tincture has been employed with considerable success in the proportion of one or two fluidrachms to a fluidounce of water.

In regard to the different preparations of iodine, practitioners do not all accord as to which is deserving of the preference. The ioduretted iodide of potassium, in the form of Lugol's solution, has generally been selected; but, of late, iodide of potassium has been more employed perhaps. A modern writer, Dr. A. Buchanan, is inclined to place them in the order of therapeutical value as follows:—iodide of starch, hydriodic acid (iodine,) and iodide of potassium; although he admits, that the superiority which he ascribes to the first is, perhaps, owing to his having prescribed it most frequently. The action of all is similar; and the only mode, he thinks, of explaining such similarity of action of substances so dissimilar in nature, is by considering hydriodic acid as the active principle,—free iodine being immediately converted in the stomach into hydriodic acid.

It has been imagined by many, that when iodine disagrees, it is

owing to free iodine acting on the stomach; and hence the tincture has been regarded as an objectionable form; but the same symptoms are said to have resulted from the use of the iodides. Dr. C. J. B. Williams, however, is disposed to ascribe them to free iodine existing in these preparations also; to obviate which, it has been recommended, that the patient should take a piece of bread or biscuit after each dose, —the starch combining with the free iodine, and forming a harmless compound. It may be sufficient to direct, that they should not be taken on an empty stomach. Should morbid phenomena arise, that are referable to the remedy, it must, of course, be discontinued.

Iodine is not readily given in substance, pill or powder. Its dose is about half a grain. Externally, it is applied in the form of tincture, ointment, or watery solution, or in baths or fumigations. Frictions with it readily occasion considerable irritation of the skin, which commonly soon passes away, when the friction is suspended for a while. After bathing a part of the cutaneous surface, painful rubefaction often ensues, which is usually followed by perspiration and sleep. Dr. Pereira says, that the most effectual method of employing iodine externally is the *endermic*, an ioduretted ointment being applied to the *cutis vera* after the epidermis has been removed by a blister. The plan is not, however, much used.

TINCTURA IODINI, TINCTURE OF IODINE. (*Iodin.* ℥j; *Alcohol*, Oj.) It has been urged as an objection to this formula, that its strength is apt to vary; that it deposits iodine in the crystalline form; undergoes decomposition when exposed to solar light,—the iodine taking hydrogen from the alcohol and forming hydriodic acid, which acts on the spirit, and forms a little hydriodic ether; and moreover, that the free iodine is deposited when water is added, and may irritate the stomach; but the last objection is the least forcible of all, as such a result is, undoubtedly, very rare. To obviate these objections, however, the next preparation has been introduced,—the simple tincture being chiefly used as an external application. Sixteen minims of the tincture contain one grain of iodine, and the ordinary dose is ten to twenty drops gradually increased, three times a day, in sugared water, or in wine. The mode of employing it externally has been already mentioned.

TINCTURA IODINI COMPOSITA, COMPOUND TINCTURE OF IODINE. (*Iodin.* ℥ss; *Potassii iodid.* ℥j; *Alcohol*, Oj.) Iodide of potassium is added in this preparation to prevent the deposition of free iodine. The dose is ten to twenty drops, gradually increased. Dr. Todd has recommended an 'Iodine paint' composed of 64 grains of *iodine* and 30 grains of *iodide of potassium* in an ounce of *alcohol*, to be applied freely by means of a camel's hair brush, where effusion has taken place into synovial membranes or sheaths.

UNGUENTUM IODINI, OINTMENT OF IODINE. (*Iodin.* gr. xx; *Alcohol.* ℥xx; *Adipis* ℥j.) This ointment, when rubbed repeatedly on the skin, induces a pustular eruption. Should it be desirable to avoid this, its strength must be reduced by an additional quantity of lard.

UNGUENTUM IODINI COMPOSITUM, COMPOUND OINTMENT OF IODINE. (*Iodin.* ʒss; *Potass. ioidid.* ʒj; *Alcohol.* f.ʒj; *Adipis* ʒij.) Employed in the same cases as the last.

20. POTASSII IODIDUM.—IODIDE OF POTASSIUM.

Iodide or *Ioduret of potassium*, *Hydriodate of potassa*, according to the Pharmacopœia of the United States, is made by mixing iodine with distilled water, and adding iron filings so as to form iodide of iron, which is decomposed by carbonate of potassa; thus forming carbonate of iron by precipitation, and iodide of potassium in solution, which, by evaporation, yields crystals.

Iodide of potassium, thus made, is in white or transparent crystals, which are wholly soluble in two-thirds of their weight of water at 60°. The solution dissolves iodine, forming *ioduretted iodide of potassium*. The iodide is likewise soluble in alcohol. It is exceedingly liable to adulteration both from faulty manufacture and fraud. Dr. Pereira states, that in 1829 he analyzed a sample, which contained 77 per cent. of carbonate of potassa: Dr. Christison affirms, that he has seen specimens which contained only 9.5 per cent. of the pure salt; and it would appear, that at one time most of the iodide of potassium used in Great Britain was of this composition. In such case, it is said to be granular and deliquescent. (Christison.) Ten grains of the pure iodide in solution decompose 10.24 grains of nitrate of silver.

The medical properties of this salt are identical with those of iodine, than which it is now more frequently prescribed. It may be given in very large doses, without producing any unpleasant effects; yet occasionally it seems to act as an irritant, and therefore caution ought to be indulged, especially as it has been shown that the salt is very liable to adulteration. Dr. Buchanan affirms, that he has given it in the dose of ʒss, and the only precaution he observed was to make the patient drink freely of diluents. He gave it in these large doses to determine some physiological questions in regard to its absorption. Two drachms were taken by a young man affected with gonorrhœa; and as soon as the medicine made its appearance in the urine, blood was drawn from the arm. On examining the blood, both the serum and crassamentum were found deeply impregnated with iodine. It has been given internally in all the cases in which iodine has been prescribed; and in large doses is a favourite preparation in syphilitic, syphiloid, and other cachexiæ; and in rheumatism. M. Lugol appears to have used it mainly as a solvent to iodine, and he considered it inferior to the latter as a therapeutic agent; but no chemical or other prepossession can set aside the overwhelming testimony that has been adduced in its favour. The author has given it largely, and has certainly obtained from it all the advantages which the preparations of iodine are capable of affording. A case of salivation by it has been published.

The ordinary dose is three grains, three times a day. The author has not exceeded twenty grains for a dose; but it has been carried to a much greater extent. It is given in the state of solution, (*Potass.*

iodid. ℥j; *Aquæ destillat.* f.℥j. Dose, fifteen drops three times a day,) associated generally with the use of an ointment of iodine. Most frequently, however, iodine is added to it to form an *ioduretted iodide*, as in the

LIQUOR IODINI COMPOSITUS, COMPOUND SOLUTION OF IODINE. (*Iodin.* ℥vj; *Potass. iodid.* ℥iiss; *Aquæ destillat.* Oj.) This solution, also called *Compound solution of iodide of potassium* and *Solution of ioduretted iodide of potassium*, is commonly used as *Lugol's solution*. The ordinary dose is ten or fifteen drops, three times a day, in sugared water; but it may be carried much farther. Lugol himself had solutions of various strengths, both for internal and external use.

The formulæ for *Tinctura iodini composita*, and *Unguentum iodini compositum*, which are ioduretted iodides of potassium, have been given before, (p. 309).

21. FERRI IODIDUM.—IODIDE OF IRON.

The general properties of iodide of iron have been described under the head of Tonics. (Vol. ii. p. 62.) It was then stated, that the salt is especially adapted for cases in which there appears to be torpor in the system of nutrition. It has been given in various cachexiæ—scrofulous, cancerous, scorbutic, tubercular, and hydropic; and has often proved highly serviceable. It appears to be one of the best remedies we possess, wherever a eutrophic and tonic agency is needed.

The dose of **LIQUOR FERRI IODIDI**, (Vol. ii. p. 64,) as a eutrophic, is ten drops, three times a day, in sugared water,—gradually increasing the quantity.

22. PLUMBI IODIDUM.—IODIDE OF LEAD.

Iodide of lead is formed, according to the London Pharmacopœia, by the double decomposition of iodide of potassium and acetate of lead. The precipitate formed is iodide of lead. It is of a bright yellow colour, devoid of taste and smell, and very sparingly soluble in cold water. It dissolves in boiling water, from which it mainly separates, as the solution cools, in the form of minute, shining, yellow, crystalline scales.

Iodide of lead is not an irritant, even when applied to a denuded surface; nor is it an active agent, when administered internally. It has been given in the dose of a quarter or half a grain in scrofulous affections of the glands, joints, &c., made into a pill with confection of roses. Some have administered it in much larger quantities. Dr. Pereira gives the dose at three or four or more grains,—Dr. O'Shaughnessy says ten grains are readily borne, without the slightest annoyance; and M. Bally has given 30 grains in a dose. It is applied externally, in the form of ointment, in the way of friction, in scrofulous and other indolent swell-

ings. **UNGUENTUM PLUMBI IODIDI**, (*Plumb. iodid.* ʒj : *Adipis* ʒviii;) is officinal in the London Pharmacopœia.

Some other preparations of iodine are likewise used—23, **IODIDE**, and 24, **RED IODIDE OF MERCURY**, which have been already described, (p. 300).

25. **IODIDE OF ARSENIC** has been frequently used in phagedenic tuberculous herpes, in the form of ointment, (*Arsenic. iodid.* gr. iij; *Adipis* ʒj.) It has been also given internally with success in lepra and impetigo, in the dose of one-tenth of a grain. It is a very poisonous substance, and requires to be administered with caution.

26. **IODIDE OF MERCURY AND ARSENIC**, the mode of preparing which is given elsewhere, (see the author's *New Remedies*, 5th edit. p. 368, Philad., 1846,) has been prescribed largely as a eutrophic in chronic cutaneous diseases—as psoriasis, lepra, lupus, and in scrofulous and syphilitic affections. It has, likewise, been used externally in the same diseases.

27. **IODIDE OF BARIUM**, administered in small doses, has been found serviceable in scrofulous and other cachexiæ, in which chloride of barium is indicated. M. Biett gave it in cases of scrofulous swellings, and applied it externally;—(*Barii iodid.* gr. iv; *Adipis* ʒj.)

28. **SESQUI-IODIDE OF CARBON** has been used with advantage in cases of enlarged glands in the form of ointment, (*Carbon. sesqui-iodid.* ʒss; *Cerat.* ʒvj;) and also in lepra and porrigo.

29. **IODIDES OF QUINIA AND CINCHONIA** have been employed for the cure of scrofulous tumours, in cases where iodine and tonics are indicated.

Iodide of quinia may be prepared, according to Dr. A. T. Thomson's formula, by triturating together in a mortar 164.55 grains of pure quinia, and 126.3 grains of iodine,—the latter being added to the former until the whole is intimately mixed; and then boiling the mixture in a moderate quantity of distilled water at first, adding more by degrees, until as much is added as will give one grain of iodine for each fluidrachm of the solution.

Iodide of quinia, in solution, is of a pale straw colour, limpid, evolving a faint odour of iodine, and impressing upon the palate the bitter of quinia. The real nature of the salt contained in the solution has not been determined by Dr. Thomson.

30. **IODIDE OF AMMONIUM** was introduced into medical practice by M. Biett, as a valuable agent in chronic cutaneous diseases, and especially in lepra and psoriasis. It is used in the form of ointment: (*Ammon. iodid.* ʒj—ʒj; *Adipis* ʒj.) As the ointment is readily decomposed, it ought to be freshly prepared, and be excluded from the air.

31. IODIDE OF STARCH is a favourite preparation with Dr. Buchanan, of Glasgow; but it is rarely employed. The dose is \mathfrak{zss} , gradually increased.

32. SULPHURIS IODIDUM, IODIDE OF SULPHUR, is officinal in the last edition of the Pharmacopœia of the United States. It is formed by heating slightly a mixture of iodine and sulphur in certain proportions. It is a dark substance; very deliquescent, and resembling, in appearance, sesquisulphuret of antimony. It is entirely dissipated by heat, and when boiled in water, iodine escapes with the vapour, and sulphur is deposited nearly pure.

Iodide of sulphur is not given internally, but it forms an excellent application in many chronic cutaneous diseases. It has been found especially efficacious in psoriasis, applied in the form of friction. It has also been used with success in lepra vulgaris, acne indurata, porrigo, lupus, herpes pustulosus, h. labialis, &c. The author has found it the best application in some cases of inveterate porrigo of the scalp; and he regards it as an excellent local application in chronic cutaneous affections in general. The ointment may be made of *Iodide of sulphur* $\mathfrak{3j}$ — \mathfrak{zss} ; *Lard* or *simple cerate* $\mathfrak{3j}$; *Oil of Bergamot* gtt. x.

The inhalation of the vapour of the iodide was employed by Dr. Copland in a case of humoral asthma, with temporary advantage. It has, likewise, been used as a fumigation in cases of atonic ulcers, and in chronic cutaneous affections. With this view, the sulphur and the iodine may be combined extemporaneously,—say, four parts of *iodine* to one part of *sulphur*.

33. BROMINUM —BROMINE.

Bromine, *Brominium*, *Bromineum*, which was discovered in the year 1826, and obtains its name from *βρωμος*, “a stench or smell,” is greatly allied in its chemical properties to chlorine and iodine; and in its medical virtues to the latter. It is met with chiefly in seawater, and in certain animal and vegetable substances that live therein. It has, likewise, been found in many mineral waters of this and other countries, and especially in the salt springs—as of Salina, by Professor Silliman, and of Kenawha, by the author’s late friend, Professor Emmet, of the University of Virginia.

Bromine is in the secondary list of the Pharmacopœia of the United States, (1842,) and may be obtained by various processes, which are given elsewhere, (*New Remedies*, 5th edit. p. 134; also Pereira.) In the *bittern* or mother liquor of sea-water, from which chloride of sodium has been separated by crystallization, bromine exists in the state of bromide of magnesium; this is decomposed by passing a current of chlorine through the *bittern*, which unites with the magnesium. The bromine dissolves in ether, and the solution is treated with solution of potassa, by which bromide of potassium and bromate of potassa are formed. In the meantime, the ether becomes colourless and pure, and may be employed in dissolving fresh portions of bromine. When a sufficient quantity of the salt has been obtained, it is mixed in

a retort with black oxide of manganese, and slightly diluted sulphuric acid, which occasion the disengagement of bromine in reddish, very acrid vapours, that are condensed in an appropriate receiver by means of ice or snow.

At the ordinary temperature, bromine is a fluid of a blackish red colour, when regarded in quantities; but of a hyacinth red, when placed in a thin layer between the eye and the light. Its smell is powerful and disagreeable, resembling that of chlorine, and its taste strong. It colours the skin yellow,—the colour gradually disappearing. Its specific gravity is 2.966. It dissolves in very small quantity in water; in greater proportion in alcohol; and in still greater in sulphuric ether.

Bromine—as already remarked—resembles iodine in its therapeutical relations; and, like it, belongs to the class of irritant poisons. A recent writer, Dr. Glover, places it intermediate in physiological properties between chlorine and iodine, but more nearly related to the former than to the latter. In medicinal doses, it has been administered in the same cases as iodine. It is far less frequently employed, however. It may be prescribed mixed with water, in the proportion of one part of bromine to forty parts of water. Of this, five or six drops may be given in syrup, three or four times a day, gradually increasing the dose.

34. POTASSIUM BROMIDUM, BROMIDE OF POTASSIUM, *Hydrobromate of Potassa*, is an officinal preparation in the London Pharmacopœia, and the mode of preparing it is an exact counterpart for that of preparing iodide of potassium. It may, likewise, be made by dissolving bromine in alcohol, and adding potassa, until the spirit begins to change colour; then evaporating, and heating to redness.

This salt crystallizes in cubes or rectangular four-sided tables, which are devoid of smell, and are of a pungent saline taste, similar to common salt, but more acrid. It is very soluble in both hot and cold water; slightly so in alcohol. The solution of bromide of potassium dissolves no more bromine than pure water, in which respect it does not resemble iodide of potassium.

The effects of bromide of potassium on the economy appear to resemble those of iodide of potassium. It has been used in goitre, scrofulous affections, enlarged spleen, chronic cutaneous diseases, &c., but is not much prescribed. Its dose is from four to ten grains three times a day. It may be given in sugared water. An ointment (*Potass. bromid.* ℥ss—℥j; *Adipis* ℥j;) has been rubbed on scrofulous swellings, and applied to cutaneous affections. M. Magendie adds bromine to it. (*Potass. bromid.* gr. xxiv; *Bromin.* gr. vj—xij; *Adipis* ℥j.)

35. BROMIDE OF IRON is made by heating equal parts of bromine and iron filings under water, filtering the fluid as soon as it becomes of a greenish colour, and evaporating to dryness. The reddish residue—again dissolved in water, and evaporated—is bromide of iron. It has

a brick red colour; dissolves readily in water; is deliquescent in the air, and has a very styptic taste.

It may be used in the same cases and doses as iodide of iron.

36. PROTOBROMIDE, and 37, DEUTOBROMIDE OF MERCURY resemble respectively, in their remedial powers, iodide and red iodide of mercury. They are very little used. The testimonials in their favour are referred to in another work, (*New Remedies*, edit. cit. p. 353.)

38. SPONGIA USTA.—BURNT SPONGE.

Calcined or burnt sponge is prepared by taking a convenient quantity of ordinary sponge, cutting it into pieces, and beating it to separate extraneous matters from it; burning it in a close iron vessel until it becomes black and friable; and rubbing it into very fine powder. Preuss calcined 1000 parts of sponge: of these, 343.848 parts were destroyed by heat. The residue consisted of carbon and insoluble siliceous matters, 327.0; chloride of sodium, 112.08; sulphate of lime, 16.430; iodide of sodium, 21.422; bromide of magnesium, 7.570; carbonate of lime, 103.2; magnesia, 4.73; protoxide of iron, 28.720; and phosphate of lime, 35.0. If good, it ought to evolve the violet vapour of iodine, when heated in a flask with sulphuric acid.

Since the discovery of iodine, burnt sponge has been almost laid aside as a medicinal agent. Its virtues are, doubtless, mainly dependent upon the iodine and bromine which it contains; yet a part may be owing to the animal charcoal, which—as shown elsewhere—has been found efficacious in similar cases; and we can therefore understand, that burnt sponge may have occasionally proved serviceable after iodine had failed. It has been chiefly given in goître, in scrofulous affections, and in chronic cutaneous diseases. Its dose is from one to three fluidrachms in syrup, molasses or honey.

39. OLEUM JECORIS ASELLI.—CODLIVER OIL.

Codliver oil—also called *Oleum Morrhue*, *Cod oil*—is obtained, for commercial purposes, from several of the fishes belonging to the GENUS *Gadus*; ORD. *Malacopterygii thoracici*; but especially from codfish, coalfish and burbot. Several varieties of the oil are met with in commerce, which differ from each other by their lighter or darker hue, and their greater or less transparency. According to Riecke, the oil is obtained by exposing to the sun the livers of the fish above mentioned, cut in slices; and collecting the oil that runs out. The first obtained is the yellow oil, *Oleum jecoris aselli flavum*. If the livers are running gradually to putrefaction, the oil becomes of a chestnut brown colour—*Oleum jecoris aselli subfusco-flavum*; and, lastly, after the oil has been obtained by these methods, some can still be procured by boiling the livers, which constitutes the dark brown—*Oleum jecoris aselli fuscum*. One of these only, according to Dr. Pereira, is to be met with in commerce in London. It is, probably, the second variety; and is used by

curriers for dressing leather. In Germany, the first variety seems to be most employed. It is now prepared in considerable quantity in Boston.

On analysis, it has generally been found to contain iodine and bromine in small proportion.

In Belgium, the oil of the liver of the ray—*Raja pastinaca*, *R. clavata* and *R. batis*, is preferred. It is said to contain more iodine, and to be less offensive than codliver oil.

Codliver oil has long been a popular remedy in Germany, especially in Westphalia,—as well as in Holland, and, to a less extent, in England.

It is of a repulsive taste, and often induces nausea; yet patients may soon become accustomed to it; and children often take it without repugnance. Where the stomach is readily disordered, it is rarely retained; but its retention is facilitated, if a little claret be taken after it. The effect which it induces upon the system of nutrition, when cachexia exists, is similar to that of eutrophics in general. It, doubtless, furnishes a modified chyle, and of consequence, a modified blood: this induces a new action in the tissues, which it laves,—acting, in these respects, like sugar, both dietetically and therapeutically. It has been suggested by some, that its remedial powers are owing to the iodine which it contains; but this is not believed by others; and Mr. Donovan is of opinion, that every known fact impugns the notion. It is true, that in all the specimens examined by De Jongh, minute portions of iodine could be detected; but they never exceeded .05 per cent. On the other hand, equally beneficial effects have resulted from oil that contained no iodine. Many years ago, the author stated to his clinical class, that such had been the result of his observation; and that vegetable oils had appeared to him to exert an equal action. Testimony, too, has been afforded in favour of the good effects of other animal oils. “Of fish oils,”—observes Dr. C. J. B. Williams, in the last edition of his “*Principles of Medicine*,” (1848)—“experience chiefly testifies in behalf of that from the liver of the cod; but analogy favours the supposition, that spermaceti oil and seal oil, if equally purified, would be no less eligible, and they would have an obvious advantage in their more abundant supply, and lower price:”—and he adds in a note. “I think it scarcely necessary even to advert to a supposition formerly general and still entertained by a few, that cod-oil owes its efficiency either to its offensive impurities, or to any iodine which it contains. I will merely state, that in some hundreds of cases in which I have prescribed the oil, the best effects have generally resulted from the use of the purest kind; and in many of these cases various forms of iodine had been exhibited without producing any of those marked changes which followed the taking the oil.”

Under the views possessed by the author the least offensive form of oil ought to be selected.

A recent report, (1849) of the Hospital for Consumption and Diseases of the Chest, by the physicians of the institution, is highly favourable to the use of this oil. Other animal oils not derived from the liver, and vegetable oils were tried. “The experiments hitherto made have not

shown them to possess the same powers ; but they have not been as yet sufficiently often repeated to warrant decided conclusions." The effects on 542 cases are reported. From these it appears, that in about 63 per cent. the symptoms improved ; in 18 per cent. the disease was arrested ; and in 19 per cent. it went on unchecked. One of the most striking effects was an increase in the weight of the patient ; which in some cases was astonishing. The oil now used in that hospital is straw-coloured, transparent and free from offensive smell.

Cod liver oil has been brought forward with high encomiums in scrofula, rickets, and in every form of chronic rheumatism, tuberculous cachexia, chronic cutaneous diseases, wherever, indeed, a modification is required in the system of nutrition generally or locally. It has likewise been used externally in opacities of the cornea—a drop or two being placed on the cornea with a camel's hair pencil ; and in various chronic cutaneous diseases. In some troublesome affections of the skin, especially of the hands, conjoining the characters of impetigo with erysipelatous redness and swelling, and inducing severe suffering, Dr. Marshall Hall speedily succeeded in restoring the textures to a healthy condition by its external use, after other remedies had been tried fruitlessly. For rhagades and chaps, he says, it is a preventive and a speedy cure ; and it is productive of great benefit in eczema, and other affections accompanied by excoriation and fissures of the skin.

The dose is from half a tea-spoonful to three spoonfuls two or three times a day. To children it is given by tea-spoonfuls. Its unpleasant taste can scarcely be corrected by admixture with other agents ; for which reason it is preferred by some to give it in its pure state, and to take peppermint lozenges afterwards. It is also recommended that it should be given with coffee, lemon-juice, warm table beer, or in emulsion. The taste may be disguised by chewing a piece of dried orange peel immediately before and after swallowing it.

40. CARBO ANIMALIS.—ANIMAL CHARCOAL.

Animal charcoal may be prepared from any animal substance ; but, as directed in the Pharmacopœia of the United States, it is obtained from bones, and constitutes *Ivory black* of commerce. This is, however, in an impure state, and accordingly, a process for CARBO ANIMALIS PURIFICATUS is contained in the Pharmacopœia of the United States, which consists in pouring *muratic acid*, previously mixed with *water*, gradually upon *charcoal*, and digesting with a gentle heat for two days, occasionally stirring the mixture. The charcoal, which subsides, is washed frequently with water, until it is entirely freed from acid ; and is then dried.

Animal charcoal is an ancient remedy, which Dr. Christison erroneously affirms to be now entirely abandoned. It is, indeed, much used in Germany, at the present day, as a eutrophic in scrofulous and cancerous affections ; and like burnt sponge—although it contains no iodine—has been employed with success in goître. It has been sug-

gested, that farther trials might show, that it may be used in the place of iodine; but it is doubtful, whether the properties of the two substances can be regarded as at all analogous; and whether animal charcoal be possessed of any other properties than those usually ascribed to charcoal. It is given in doses of from half a grain to three grains two or three times a day, mixed with sugar or liquorice powder. It has, also, been sprinkled on the callous edges of cancerous ulcers; and has been used in the form of ointment, as a discutient, in scrofulous swellings. It is employed in many processes of pharmacy as a decolorising agent.

41. CAL'CI CHLO'RIDUM.—CHLORIDE OF CAL'CIUM.

Chloride of calcium, Hydrochlorate or Muriate of lime, which—as its name imports—is a compound of chlorine and calcium, is made by saturating muriatic or chlorohydric acid with carbonate of lime; drying the salt; exposing it to heat, and keeping it in well stopped vessels. It is not in the list of preparations, but in that of the *Materia Medica* of the *Pharmacopœia* of the United States. It exists in sea water, and in many mineral springs; in some of which it is considered to constitute the active ingredient, as in the springs of Airthrey, Pitcaithley, and Dumblane in Perthshire, Scotland. (Christison.) It is also obtained from the residuum of certain officinal preparations—as from the manufacture of carbonate of ammonia, solution of ammonia and spirit of ammonia; from which, indeed, it is usually procured by the manufacturing chemist.

It is colourless; slightly translucent; solid; hard; friable; deliquescent; and wholly soluble in water. Its taste is bitter, acrid and saline.

In large doses, it appears to be an irritant poison; but in small doses, it has been administered, and with advantage, as a eutrophic, in scrofulous cases. With this view, it must be continued for some time. It has been considered as one of the most important ingredients in many mineral waters, that have seemed to be beneficial as alteratives. It is generally given in the form of

LIQUOR CAL'CI CHLO'RID, SOLUTION OF CHLORIDE OF CAL'CIUM, *Solution of Muriate of lime.* (*Marmor.* in frustul. \mathfrak{z} ix; *Acid muriat.* Oj; *Aq. destillat.* q. s. The acid is mixed with half a pint of water, and the marble gradually added; chloride of calcium is formed in the manner previously mentioned, which is dissolved in its weight and a half of distilled water, and the solution is filtered.) The dose is from f.℥ss to f.℥j gradually increased. It may be taken in sugared water or milk.

It is sometimes also used as a wash to scrofulous sores and chronic cutaneous affections. (*Calci chlorid.* \mathfrak{z} j— \mathfrak{z} ij; *Aquæ destillat.* f.℥viii;) and, also, in the form of ointment, (*Calci chlorid.* \mathfrak{z} j; *Adipis* \mathfrak{z} j;) in similar cases.

42. BA'RII CHLO'RIDUM.—CHLORIDE OF BA'RIUM.

Chloride of barium, Muriate of baryta, Baryta murias, is made by gradually adding *carbonate of baryta* to *dilute muriatic acid*, to saturation; filtering the solution, and evaporating, so as to form crystals, which are right rhombic plates or tables; sometimes double eight-sided pyramids. Its density is 2.82; taste disagreeable and bitter. It is wholly soluble in water—100 parts at 60° dissolving 43.5 of the crystallized salt; at 222°, 78 parts. It is slightly soluble in alcohol of the pharmacopœia; but is said to be insoluble in pure alcohol.

In large doses, the chloride acts like acro-narcotic poisons, and may induce death. In small medicinal doses, its effects appear to be analogous to those of chloride of calcium, and it has been given in the same cases. It has been chiefly prescribed in scrofula; but, at times, in other dyscrasies; and in chronic cutaneous diseases, bronchocele, &c. It has been used as a topical application in chronic cutaneous affections; as a collyrium in strumous ophthalmia, and in opacities of the cornea; and as an ointment (*Barii chlorid.* gr. iv; *Adipis* ʒj) it has been applied to strumous sores, and to chronic cutaneous affections. It is usually administered in the form of

LIQUOR BA'RII CHLO'RID, SOLUTION OF CHLORIDE OF BA'RIUM, *Solution of Muriate of Baryta.* (*Barii chlorid.* ʒj; *Aquæ destillat.* f.ʒiij.) The dose of this is five drops three times a day, gradually increased till it induces nausea or vertigo; when it should be diminished. It is much employed in pharmacy as a test for sulphuric acid and sulphates.

ARSEN'ICI PRÆPARA'TA.—PREPARA'TIONS OF AR'SENIC.

The various preparations of arsenic are possessed of eutrophic virtues, and when continued for a proper length of time they so alter the function of nutrition as to remove diseased actions, which may have been persisting unmodified by other agents. In chronic cutaneous diseases,—for example, lepra, psoriasis, impetigo, &c., arsenic has been found a most valuable agent; and often the beneficial results have occurred without any other manifest effects having been produced by the remedy. In all cases, however, the results should be watched; and if any of the phenomena that have been referred to elsewhere, (Vol. ii. p. 87,) and that are fairly ascribable to the administration of arsenic be observed, it must be discontinued, or the dose be diminished, as the case may seem to require. This, indeed, applies to all cases in which arsenic is given as a eutrophic; inasmuch as—like every other remedy belonging to the class—a protracted use of it is necessary to break in upon the *vice* in the system of nutrition. It is as a eutrophic, too, that arsenic has been recommended in syphilis, syphiloid and rheumatic affections; and in cancer, in which it would seem to have occasionally rendered service.

43. ACIDUM ARSENIOSUM.—ARSENIOUS ACID.

Arsenious acid—whose properties have been detailed elsewhere, (Vol. ii. p. 86,)—is the form in which arsenic is generally administered in the above mentioned diseases. It may be given in the dose of one-tenth to one-eighth of a grain, made into a pill with crumb of bread; or LIQUOR POTASSÆ ARSENITIS (Vol. ii. p. 87,) may be given in the dose of eight or ten drops two or three times a day.

Pilula Asiaticæ, Asiatic pills are made of *Arsenious acid*, gr. lv; *Black pepper powder* ℥ix; *Gum arabic*, sufficient to make 800 pills, each of which contains about one-twelfth of a grain of arsenious acid. They are much employed in India in cases of syphilis, elephantiasis, and other cutaneous diseases.

44. AMMONIÆ ARSENIAS.—ARSENATE OF AMMONIA.

This preparation is made by taking *arsenic acid* one part, dissolving it in water, and adding *pure or carbonated ammonia* sufficient to saturate it;—or, as follows:—take of *arsenious acid*, one part; *nitric acid*, four parts; *muratic acid*, half a part,—saturate the solution with *carbonate of ammonia*, and let the arsenical salt crystallize. This salt has been employed in several obstinate cutaneous diseases, and especially in psoriasis inveterata. One grain may be dissolved in a fluid-ounce of distilled water; and 20 to 25 drops of the solution be begun with daily; gradually increasing the dose, until it reaches a drachm or more in the twenty-four hours.

ARSENATE OF SODA—in solution termed *Aqua arsenicalis Pearsonii*, and, by the French, *Solution de Pearson*—is possessed of the same properties as arseniate of ammonia.

Of the virtues of IODIDE OF ARSENIC, and IODIDE OF MERCURY AND ARSENIC, the author has already treated, (Vol. ii. p. 312).

45. FERRI ARSENIAS.—ARSENATE OF IRON.

Arseniate of iron—which occurs naturally as *scorodite*, and is prepared artificially by double decomposition, according to a process given elsewhere—(*New Remedies*, 5th edit. p. 286, Philad. 1846,) has been recommended both as an internal and external remedy in cancerous formations. Its external application has been given already, (Vol. ii. p. 275). It has been prescribed internally in the form of pill, (*Ferri arseniat.* gr. iij; *Extract. gentian.* ℥iss; *Syrup. vel Aquæ* q. s. ut fiat massa in pilulas xlvij dividenda. Dose, one three times a day.)

46. QUINIÆ ARSENIS.—ARSENITE OF QUINIA.

Arsenite of quinia has been lately recommended by Dr. Kingdon as a eutrophic, in chronic cutaneous affections especially. It is formed by dissolving arsenious acid and subcarbonate of potassa in distilled water, boiling and adding sulphate of quinia, previously dissolved in boiling distilled water. The precipitate is arsenite of quinia, which is

washed and dried on a filter. It is uncrystallizable; and insoluble in water, but soluble in alcohol.

The dose is one-third of a grain twice a day, gradually increased to three or four times a day, in the form of pill, or powder, mixed with a little sugar or gum.

47. AURI PRÆPARATA.—PREPARATIONS OF GOLD.

The preparations of gold have long been used in medicine; but they had been wholly abandoned, when they were revived upwards of thirty years ago by M. Chrestien; since which time they have been much employed; and certain of them are received into the pharmacopœias of Continental Europe. They all agree in their action on the economy.

These preparations are corrosive in large doses; but in medicinal doses, they have exhibited valuable eutrophic virtues. The secretions appear to be increased; and occasionally actual salivation ensues, which differs from that induced by mercury,—being always slow in appearing, and by no means so exhausting; nor do troublesome ulcerations occur: the saliva is thinner, and not so tenacious: an *aural* fever, like the *mercurial*, can also be caused by them.

Possessed of these properties, it is not surprising, that the preparations of gold should have been prescribed in the same diseases as mercury. The testimony of many observers is recorded in their favour in syphilis. It would seem, that their action is slow. In some forms of scrofula, too,—as strumous ophthalmia, and strumous porrigo,—they would seem to have been efficacious. Experiments, however, have been discordant, even in regard to the activity of some of the preparations,—the chloride or muriate of gold having been given in large doses by MM. Baudelocque and Velpeau, without inducing any irritant effects. They have, likewise, been prescribed in scirrhus and cancerous affections, rubbed upon the gums; or in cancer of the uterus, rubbed on the labia pudendi. In every form of cachexia, they have been given; but they are not much used now; and one weighty objection to them—in the absence of any decided superiority over other agents—is, that they are very expensive.

48. AURUM METALLICUM.—METALLIC GOLD,

has been given largely, and, according to some, successfully; but in the opinion of others, it has no action on the economy. It would be strange, indeed, if a substance, so difficult of oxidation, should have any effect. It has been prescribed in the dose of from a quarter of a grain to a grain. *Gold powder*—*Pulvis auri*—may be obtained by amalgamating gold and quicksilver; and driving off the latter by heat. It may also be prepared by throwing it down from a dilute solution in nitro-muriatic acid by means of green sulphate of iron. From one to three grains, mixed with powdered starch, have been rubbed on the tongue.

49. AURI CHLO'RIDUM.—CHLORIDE OF GOLD.

This preparation, called also *Muriate of gold* and *Terchloride of gold*, is received into several of the European pharmacopœias. It is made by digesting one part of *gold leaf* in three parts of *nitro-muriatic acid*, in a sand bath, and evaporating gently to dryness.

It is one of the most active salts of gold, greatly resembling corrosive chloride of mercury in its operation on the economy. Even a tenth of a grain, according to M. Orfila, has induced unpleasant gastric irritation; yet, we have seen, it has been given to a much greater extent without inconvenience. It has been prescribed both internally and externally, in syphilitic, hydropic, strumous and other cachexiæ. Its dose is from one-sixteenth to one-twelfth of a grain, gradually but slowly increased; or it may be rubbed on the gums. It has also been applied externally in the form of ointment, (*Auri chlorid. gr. iv: Adipis 3j*;) or as a collyrium in scrofulous ophthalmia, (*Auri chlorid. gr. ij; Aquæ f. 3vj.*)

50. AURI ET SO'DII CHLO'RIDUM.—CHLORIDE OF GOLD AND SO'DIUM.

This salt—called also *Muriate of gold and sodium*, and *Auro-terchloride of sodium*—is likewise in some of the pharmacopœias of Continental Europe. It may be prepared by dissolving four parts of *gold* in *aqua regia*, and evaporating the solution to dryness; adding thirty-two parts of *water*, and one part of *chloride of sodium*, and evaporating to one-half. On cooling, crystals form. It is milder than the last preparation; but may be employed in similar cases, doses, and modes of administration.

51. AURI CYANURE'TUM.—CYAN'URET OF GOLD.

Cyanuret, *Cyanide*, or *Tercyanide of gold* may be prepared by carefully adding a solution of *cyanuret of potassium* to one of *chloride of gold*, until a precipitate—cyanuret of gold—ceases to fall. It has been given in powder, mixed with gum arabic powder or sugar, in the dose of from one-sixteenth to one-tenth of a grain and more; or rubbed on the gums, associated with orris powder, in syphilis and scrofula. It may, likewise, be prescribed in solution. (*Auri cyanuret. gr. iij; Aquæ f. 3viiss; Alcohol. f. 3ss.*) Dose, a tea-spoonful twice a day; gradually increased.

52. AURI IOD'IDUM.—IODIDE OF GOLD.

Iodide of gold is directed, in the French *Codex*, to be made by adding a solution of pure *iodide of potassium* to a solution of *chloride of gold*. The iodide of gold, which is precipitated, is collected on a filter and washed with alcohol to remove the excess of iodine precipitated with it. It has been used in the same cases as the other active preparations of gold, in the dose of from one-fifteenth to one-tenth of a grain.

It may also be made into an ointment, and be applied to syphilitic ulcers.

53. AURI OXIDUM.—OXIDE OF GOLD.

Oxide, Teroxide or Peroxide of gold, Auric acid, is directed in the French *Codex* to be prepared by boiling four parts of *calcined magnesia* with one part of *terchloride of gold*, and forty parts of *distilled water*. The oxide is then washed, first with water to remove the chloride of magnesium, and afterwards with dilute nitric acid to dissolve the excess of magnesia. It has been administered in the dose of from one-tenth of a grain to a grain in the same cases as the other preparations of gold.

These are the chief preparations of gold that have been employed in medicine. For a more detailed account of their reputed virtues, see the author's *New Remedies*, edit. cit. p. 113.

54. ARGENT'II PRÆPARATA.—PREPARATIONS OF SILVER.

Various preparations of silver have been introduced into practice as eutrophics in the same diseases as the preparations of gold, and especially in syphilis. M. Serre, Professor of Surgical Clinics at Montpellier, employed the *chloride, cyanuret, and iodide; divided metallic silver; the oxide*, and the *chloride of ammonia and silver*. At first, these were administered iatraleptically; the chloride, the cyanuret, and the iodide in the quantity of one-twelfth of a grain; the chloride of silver and ammonia in the quantity of one-fourteenth of a grain; and the oxide of silver, and divided silver in the dose of one-eighth and one-quarter of a grain. These doses were often found, however, to be too small; he, therefore, raised those of the chloride and the iodide to one-tenth and one-eighth of a grain. The other preparations were augmented in the same proportion, with the exception of the chloride of silver and ammonia, which required more precautions than any of the others. M. Serre gave them internally, also.

The results of the observations of others have not confirmed those of M. Serre. M. Ricord employed the various preparations, made according to the formulæ of M. Serre, in the same doses; but not being able to observe any effect that could be fairly ascribed to them, he ventured upon considerably large doses,—as much, for example, as twelve grains a day of the iodide and cyanuret,—but without any marked results.

In this country, the preparations of silver have been but little used in syphilis, nor do they appear to merit special attention. For the testimony adduced in their favour, and the mode of preparing and exhibiting them, see the author's *New Remedies*, 5th edit. p. 78.

55. The PREPARATIONS OF PLAT'INUM, it is affirmed, possess properties analogous to those of gold and silver.

56. FERRI PRÆPARATA.—PREPARATIONS OF IRON.

The various preparations of iron are employed occasionally in cancerous and other cachexiæ, as well as in lupus, and chronic cutaneous diseases; but subcarbonate of iron, (Vol. ii. p. 55,) is calculated to answer all the purposes of the other chalybeates. It has been prescribed, in very large doses, and often with excellent effect, in enlargements of the spleen, that accompany or succeed intermittents. It may be given in dose of from gr. x to ʒj and more, three times a day.

57. ALKA'LIA.—AL'KALIES.

Alkalies have been long employed under the idea that they rendered the blood thinner, and might soften obstructions, and remove tumours; hence they have been freely exhibited in all hypertrophied conditions of the glandular organs; but they are not much relied upon at the present day, although they doubtless have considerable power in modifying the condition of the circulating fluid, and consequently, that of the tissues bathed by it. In various cachexiæ—the syphilitic and the strumous especially—they are considered by many to have proved extremely serviceable. Like mercurials, too, when given in diphtheritic inflammations, or those that are apt to end in the exudation of an albuminoid secretion, they are presumed to exert a liquefacient action on the blood. Hence, they have been administered in croup, and in diphtheritis in general.

Under similar views in regard to their powers as eutrophics, they have been prescribed in chronic cutaneous diseases; and wherever it has been desirable to excite a new action in the system of nutrition, generally or partially.

Any of the alkalies may be given; but LIQUOR POTASSÆ is most frequently chosen. It may be prescribed in the dose of ten drops, gradually increased to f.ʒj or more.

58. AC'IDA MINERALIA.—MIN'ERAL ACIDS.

NITRIC ACID, (Vol. ii. p. 73,) does not perhaps possess any properties which especially adapt it as a eutrophic; yet it is the acid which, by common consent, appears to be selected. It has been extensively used in syphilitic cachexia as a substitute for mercury; and has unquestionably been of service, especially where mercury has not agreed. It may not, however, have exerted any energetic action on the disease; for it is now admitted, that syphilis can, in the generality of cases, be cured without the use of mercury. Much reliance is not now placed in it, however, although it is still occasionally prescribed. It has, likewise, been given internally, especially in India, in chronic liver disease; but it is not clear, that its beneficial agency in such cases may not be owing to its tonic influence on the stomach. It is not unfrequently used as a tonic in chronic disease, and in convalescence from acute diseases, either alone or associated with bitter infusions. The dose of

the diluted acid of the Pharmacopœia of the United States is from gtt. xx to gtt. xl, three times a day.

An ointment of nitric acid, (Vol. ii. p. 255,) is used in various chronic cutaneous diseases, especially in porrigo and scabies, and as an application to syphilitic sores.

ACIDUM NITRO-MURIATICUM, NITRO-MURIATIC ACID. (*Acid. nitric. f. ℥iv; Acid. Muriat. f. ℥viii.*) This acid has been introduced into the last edition of the Pharmacopœia of the United States. It is also termed *Nitro-hydrochloric acid*, and *Aqua regia*. It has been used as a eutrophic in the same cases as nitric acid, and is employed also externally in syphilis and chronic liver affections. It is applied in the form of pediluvia,—the legs, thighs, and body being, at the same time, sponged with it. A fluidounce and a half of the acid may be added to a gallon of water, and the patient may keep his feet in the bath for twenty or thirty minutes. It produces more or less pricking of the surface, and is said at times to cause soreness of the mouth and increased flow of saliva. The effects of the bath have been ascribed to the chlorine evolved.

The dose of nitro-muriatic acid, in the above mentioned cases, may be ten or fifteen drops diluted with water, two or three times a day.

59. CHLORINUM, OR CHLORINIUM.—CHLORINE.

Chlorine is most commonly prepared by mixing intimately three parts of dried *chloride of sodium* with one part of *oxide of manganese*; and then, in a retort, adding as much *sulphuric acid*, previously mixed with its own weight of *water*, as will form a mixture of the consistence of cream. By applying a gentle heat, chlorine gas is copiously evolved, and may be collected over water. In this process, the chloride of sodium is decomposed and the oxide of manganese parts with a portion of its oxygen to convert the sodium into soda; with which, as well as with the oxide of manganese, the sulphuric acid unites, and the chlorine is set free in the form of gas.

Chlorine gas is of a greenish-yellow colour, of a peculiar strong, disagreeable, stifling odour; and is irrespirable, except when very largely diluted with air. Of its effects when inhaled, mention has been made under **EXPECTORANTS**, (Vol. i. p. 257).

Fumigations of this gas were particularly recommended, about twenty years ago, by Dr. Wallace, of Dublin. They would seem to resemble, in their action, the nitric and nitro-muriatic acid baths; the latter of which has been supposed to owe its efficacy to chlorine. It has been used advantageously in chronic liver diseases, especially where there is disordered secretion of the liver; and in many other morbid conditions, as hypochondriasis, cachexiæ, and in all affections in which a prolonged excitation of the skin, and a restoration of its suppressed or impaired functions could be esteemed serviceable;—hence in old cases of syphilis, scrofula, chronic rheumatism, chronic cutaneous affections,—as lepra, psoriasis and scabies,—and in many of these it has been highly beneficial.

AQUA CHLO'RINI, *Solution of chlorine, Liquid oxymuriatic acid*, is contained in many pharmacopœias. It is in those of Edinburgh and Dublin. In the former it is directed to be prepared as follows:—Take of *chloride of sodium*, gr. 60; *sulphuric acid*, (commercial,) f.℥ij; *red oxide of lead*, gr. 350; *water* f.℥viij. Triturate the chloride of sodium and oxide together; put them into the water contained in a bottle with a glass stopper; add the acid; and agitate occasionally till the red oxide becomes almost white. Allow the insoluble matter to subside before using the liquid.

Chlorine water has been occasionally given internally in chronic diseases of the liver; in many chronic cutaneous affections; and in various cachexiæ, especially the syphilitic and strumous. In a dilute state, it has been used as a wash in skin complaints, and in atonic and malignant ulcers,—partly, however, with the view of correcting the fœtor; in which cases, as will be seen hereafter, it often serves a highly useful purpose; with this object, however, some of the chlorinated preparations are most frequently employed. It has been used, also, like nitro-muriatic acid, as a bath in hepatic and syphilitic diseases.

It is very liable to be decomposed; and therefore ought never to be prescribed in quantity larger than is needed for twenty-four hours, as, by frequently opening the vial in which it is contained, decomposition readily ensues. The vial should be put into a dark place, and be surrounded by black paper.

The dose of *Aqua Chlorini* of the British pharmacopœias is f.℥ss to f.℥ss. An ointment is sometimes prepared of it; (*Aquæ chlorin.* p. j; *Adipis* p. vij;) which is used in scabies. It is made, also, into a *liniment*, (*Aq. chlorin.* ℥j; *Ol. oliv.* ℥j;) which is used in scabies, porrigo and herpes; and, at times, is prescribed as a gargle in ulceration and chronic inflammation of the mouth and fauces.

60. CALX CHLORINA'TA.—CHLO'RINATED LIME.

Chlorinated lime, Chloride of lime, Hypochlorite, Chlorite or *Oxymuriate of lime, bleaching powder*, is a compound resulting from the action of *chlorine* on *hydrate of lime*. It is prepared on a very large scale for the use of bleachers; and, therefore, is amongst the list of articles of the *materia medica* in the *Pharmacopœia* of the United States. The London College has a form for its preparation, which consists in passing the vapour of *chlorine* into *lime*, until it is saturated. The chlorine is disengaged by the action of chlorohydric acid on oxide of manganese.

The nature and composition of this chemical is a subject of dispute; and hence the term *chlorinated lime*, which has been adopted by the London, Edinburgh, and United States Pharmacopœias, in place of *chloride of lime*. It is of a grayish white appearance; pulverulent; dry, or but slightly moist; and wholly dissolved by chlorohydric acid with the disengagement of chlorine. It is often of very inferior quality, either owing to the lime having been insufficiently charged with chlorine, or to its having been exposed to the air, so that chloride of calcium and carbonate of lime result.

Chlorinated lime—like chlorine, on which its virtues are really dependent—has been administered in scrofulous cachexia, and especially in scrofulous swellings; it is rarely, however, given internally as a eutrophic. Externally, it is applied in many cases,—in torpid ulcers of various kinds—the phagedenic, scrofulous, syphilitic, cancerous, gangrenous, &c., in which it acts as an excitant or antiseptic. It is employed, also, in strumous swellings of the glands, joints, &c., in goître, and in various chronic diseases of the skin. Dr. Christison affirms, that he never uses any other remedy in itch. “A solution, containing between a fortieth and sixtieth part of chlorinated lime, applied five or six times a day, or continuously with wet cloths, allays the itching in the course of twenty-four hours, and generally accomplishes a cure in eight days.”

When given internally, the dose may be gr. j to gr. iv, two or three times a day, in pill or solution. When applied externally, it may be dissolved in water in various proportions, (f. ʒj to f. ʒss, to f. ʒviij of water.) In cases of itch, the strength has sometimes been—*chlorinated lime* ʒiij, *water* Oj. In the form of *ointment*, (*Calcis Chlorinat.* ʒj; *Adipis* ʒj,) it has been rubbed on scrofulous swellings, goître, &c., and has been occasionally applied as a *cataplasm*, (*Calcis chlorin.*; *Sodii chlorid.* āā ʒss; *Aquæ destillat.* Oss; *Farinæ sem. lin.* q. s.;) to scrofulous tumefactions of the joints.

Chlorinated lime enters into the formation of the next preparation.

61. LIQUOR SODÆ CHLORINATÆ.—SOLUTION OF CHLORINATED SODA.

This preparation, called also *Hypochlorite of soda*, *Labarraque's Soda disinfecting liquor*, *Oxymuriate of soda*, is made by dissolving *carbonate of soda* and *chlorinated lime* separately in water; setting the latter aside until the dregs subside: then decanting the liquor, and mixing the two solutions; again decanting the clear liquor from the precipitated carbonate of lime by passing it through a linen cloth, and keeping it in bottles secluded from the light.

The solution—thus prepared, according to the directions of the Pharmacopœia of the United States—is a colourless liquid, having a slight odour of chlorine. Its taste is astringent; and like chlorine, and all the chlorinated preparations, it destroys vegetable colours. In regard to its chemical constitution, the same remarks are applicable as were made on chlorinated lime.

In its therapeutical properties, chlorinated soda resembles chlorinated lime, and has been prescribed, internally and externally, in the same cases. It is preferred, however, for internal, whilst chlorinated lime is generally chosen for external, use.

The dose is from ten drops to a fluidrachm in plain or sugared water. When used externally, it is generally diluted with from five to ten parts of water, as an application to chronic cutaneous diseases, ulcers of various kinds, burns, &c.

62. SULPHUR.

The general properties of sulphur have been described before, (Vol. i. p. 162). As a eutrophic, it is mainly used in chronic cutaneous diseases, and especially in scabies, in which it is employed internally and externally. Associated with guaiacum, it is sometimes prescribed in gout and acute rheumatism, (see Vol. i. p. 321,) in which it is presumed to act as an excitant diaphoretic. Dr. Pereira states, that after an attack of acute rheumatism, when the joints were left in a swollen and painful state, he saw sulphur prove highly useful; but this was only in one case. The popular form in which it is taken, mixed with ardent spirit, would adapt it rather—if it be adapted at all—for the chronic form of those diseases. It certainly passes through the cutaneous capillaries, and is disengaged from them, as is evidenced by a silver watch becoming blackened, when sulphur or a sulphuret is taken: but the quantity passing through a particular portion of the capillaries, at any one time, must be exceedingly minute; and incapable, perhaps, of exerting much medicinal agency on cutaneous or other local affections. Hence, the external use is always, in such cases, combined with the internal.

Under chlorinated lime, (Vol. ii. p. 327,) it was stated, that Dr. Christison had found it an adequate substitute for sulphur in scabies; but, on the whole, sulphur is the most certain application. It is, however, so offensive, and its odour is generally considered to reveal so completely the nature of the disease for which it is used, that every endeavour has been made to discover some agent that may be equally sure, and less objectionable. The discovery of the itch insect—*Acarus scabiei*—led to the supposition, that the *modus operandi* of sulphur, in the cure of scabies, may consist in its destroying the parasite. The precise connexion, however, of the insect with the itch, is not yet clearly ascertained; and, moreover, sulphur—as already remarked—has been found efficacious in other chronic cutaneous diseases.

Sulphur has long been regarded by the people as a great eutrophic or purifier of the blood, and even at this day it is a popular remedy, with this view, at spring and fall. Either SULPHUR or SULPHUR PRÆCIPITATUM (Vol. i. p. 162,) may be prescribed in the dose of $\mathfrak{z}\text{ss}$ to $\mathfrak{z}\text{j}$, and more, in milk; or it may be mixed with an equal quantity of molasses, and a tea-spoonful be taken night and morning. Bitartrate of potassa is often added to it.

As elsewhere remarked, sulphur, when converted into sulphurous acid by burning, and applied to the cutaneous surface in the form of an air bath, is often a valuable remedy. As such it has been used in various diseases, in which an excitant influence to the skin is indicated. In cutaneous diseases of an inveterate kind, as scabies, impetigo, and the different squamous affections, it has succeeded when other remedies had failed. The gas is exceedingly irritating, and, therefore, must be prevented from entering the air passages.

Sulphur is, however, most frequently employed externally, in one of the following forms.

UNGUENTUM SULPHURIS, SULPHUR OINTMENT. (*Sulphur* ℥ij; *Adipis* ℥ij.) This ointment, called also *Itch Ointment*, *Brimstone Ointment*, is the mildest form that is used, and is especially applicable to scabies in children. Both it and the next preparation may be rubbed over the affected parts, before the fire, night and morning, for five or six days; the patient continuing to wear the same clothes. He may then be thoroughly washed, and have an entire change of clothes. In the generality of cases, three or four thorough inunctions will be sufficient; and, according to some, only one,—provided the body be covered all over with it. Some essential oil, as *oleum limonis* or *oleum bergamii*, is added at times; but the smell of the sulphur is predominant.

UNGUENTUM SULPHURIS COMPOSITUM, COMPOUND SULPHUR OINTMENT. (*Sulphur*. ʒj; *Hydrarg. ammon.*; *Acid. Benzoic.* āā ʒj; *Ol. Bergamii*, *Acid. Sulphuric.* āā f. ʒj; *Potassæ nitrat.* ʒij; *Adipis* ℥ss.) This is a more irritating itch ointment than the last.

Compound sulphur ointment, of the London Pharmacopœia, is formed of *Sulphur* ℥ss; *Veratr. alb. pulv.* ʒij; *Potass. nitrat.* ʒj; *Sapon. mollis* ℥ss; *Adipis* ℥ss; *Ol. Bergamii* ℥xxx.

63. POTASSII SULPHURETUM.—SULPHURET OF POTASSIUM.

Sulphuret of potassium, *Tersulphuret of potassium*, *Potassii tersulphuretum*, *Hepar sulphuris*, *Liver of sulphur* is made by rubbing *carbonate of potassa*, previously dried, with *sulphur*, in due proportions; melting the mixture in a covered crucible over the fire; pouring it out; and, when cold, keeping it in a well-stopped bottle. This is the mode of preparation adopted in all the British Pharmacopœias, as well as in that of the United States. It is of a brownish-yellow colour when freshly broken; its taste is acrid, bitter, and alkaline; it is devoid of smell when perfectly dried; but, when moistened, acquires the odour of sulphohydric acid. Under exposure to the air, it takes oxygen, and undergoes changes which end ultimately in the formation of sulphate of potassa, and free sulphur. It is soluble in water, to which it imparts an orange-yellow colour, and a strong sulphureous odour. The stronger acids decompose it, throwing down sulphur, and disengaging sulphohydric acid.

In large doses, sulphuret of potassium is an acro-narcotic poison; but in medicinal doses, it has been administered in chronic cutaneous diseases. It is supposed, also, to be possessed of eutrophic powers in diphtheritic affections; and in glandular enlargements of a scrofulous character. It has, likewise, been used externally in various skin diseases, especially in scabies, in which sulphur is so beneficial. The dose may be three to ten grains, made into pill and given three times a day; or it may be dissolved in syrup. In the form of *bath*, it has been used in skin complaints in the proportion of one part of the sulphuret to one thousand of water. A lotion, (*Potass. sulph.* ʒij; *Aquæ Oj*); and an ointment, (*Potass. sulphur.* ʒss; *Adipis* ʒj,) are sometimes used.

64. SODÆ HYPOSULPH'IS.—HYPOSULPH'ITE OF SODA.

There are several modes of preparing this salt, which is largely used for photographic purposes. One of the best is to form neutral sulphite of soda by passing a stream of sulphurous acid gas into a strong solution of carbonate of soda, and then to digest the solution with sulphur at a gentle heat for several days. By careful evaporation, at a moderate temperature, the salt is obtained in large and regular crystals, which are very soluble in water.

Hyposulphite of soda is said to have been administered, with constant success, by physicians of Paris, who are the most versed in the treatment of chronic cutaneous diseases. It was first employed by MM. Chaussier and Bielt under the name *sulfite sulfuré de soude*; but it had fallen into neglect, when its use was revived by M. Quesneville, and the results have been entirely conformable to those obtained by MM. Chaussier and Bielt. It has been highly extolled in chronic cutaneous and scrofulous affections; and is said to be a most efficacious auxiliary to external sulphurous preparations. It is best given in syrup, made of one ounce of the hyposulphite to twelve ounces of water, and twenty-three ounces of sugar; the dose of which is f.ʒj to f.ʒij.

The salt may also be prescribed in solution in the dose of from two scruples to a drac m. It has been occasionally used as an artificial sulphur bath; from ʒj to ʒiv being dissolved in a sufficient quantity of water. If a small portion of dilute sulphuric acid or vinegar be added to the bath, whilst the patient is immersed, sulphurous acid and sulphur are set free.

65. ANTHRAXOK'ALI.

This article was introduced in 1837. Two forms are employed, the *simple* and the *sulphuretted*. The former is prepared by dissolving *carbonate of potassa* in 10 or 12 parts of boiling water, and adding as much slaked lime as will separate the potassa. The solution, thus obtained, contains only caustic potassa. The filtered liquor is placed on the fire in an iron vessel, and suffered to evaporate until neither froth nor effervescence occurs, and the liquid presents a smooth surface like oil. To this is added the levigated coal in the proportion of 160 parts to 192 parts of potassa. The mixture is stirred, and removed from the fire; and the stirring is continued until a black homogeneous powder results. This is kept in a dry place.

To obtain *sulphuretted anthrakokali*, 16 parts of sulphur must be accurately mixed with the coal, and the mixture be dissolved in the potassa as directed above.

Anthrakokali has been prescribed as a eutrophic in chronic cutaneous affections. It is also said to have been given beneficially in scrofula and chronic rheumatism.

The dose of the simple and sulphuretted preparations is a grain and a half three times a day.

66. FULIGOKALI.

This is a substance analogous to the last. It is prepared by boiling for an hour 20 parts of potassa, and 100 parts of shining soot in powder, in a sufficient quantity of water. The decoction is then suffered to cool. It is diluted with water, so that filtration may be better accomplished; is filtered, evaporated, and dried, and then enclosed in dry and warm bottles.


Sulphuretted fuligokali is prepared of fuligokali 60 parts; potassa 14 parts; sulphur, 5 parts. The sulphur and potassa are dissolved in a little water; the fuligokali is then added, and the whole evaporated, —the residuum being dried and enclosed in dry and warm bottles.

Fuligokali has been prescribed both internally and externally, but chiefly in the latter mode, in various chronic cutaneous diseases. An ointment may be made of either the simple or the sulphuretted article, by mixing one or two parts with thirty of lard. M. Gibert ascribes to them resolvent, detergent, and slightly excitant virtues. Mr. E. Wilson thinks it probable, that both anthrakokali and fuligokali owe much of their therapeutic agency to the alkali which forms their basis. He has employed fuligokali in several cases, and especially in *psoriasis palmaris*, and with more success than he has obtained from the usual remedies. What might be regarded as a weak solution of fuligokali was used by Drs. Physick, Dewees, and others, under the names of *medical lye*, *soot-tea*, *alkaline solution*, and *dyspeptic lye* (Mr. Duhamel, in *Amer. Journal of Pharmacy*, Jan., 1843).

67. POTASSÆ CHLORAS.—CHLORATE OF POTASSA.

Chlorate, oxymuriate or hyperoxymuriate of potassa may be prepared by passing *chlorine gas* slowly through a cold *solution of potassa* placed in a Woulfe's bottle. The liquid is allowed to stand for twenty-four hours in a cool place; and is then found to have deposited crystals of chlorate of potassa; which are drained, washed with water, dissolved in hot water, and recrystallized. Professor Graham advises, that carbonate of potassa should be mixed intimately with an equivalent quantity of dry hydrate of lime, and the mixture be exposed to chlorine gas. The products are carbonate of lime, chlorate of potassa, and chloride of potassium. Chlorate of potassa may be separated by crystallization. It crystallizes in nearly rhomboidal plates; and has a cool taste, somewhat similar to that of nitre. One hundred parts of water at 59° Fah. dissolve six parts.

This salt was at one time largely prescribed in consequence of its presumed action as a eutrophic, by imparting oxygen to the blood. Experiments have, however, shown, that it has been detected in the urine of patients, which, of course, negatives the presumption. Finding that the salt gives a beautiful arterial hue to venous blood, Dr. Stevens prescribed it in fever, cholera, and other malignant diseases, in which there appeared to be a deficiency of saline matter in the blood; but the testimony in its favour is by no means potent. Dr. Henry Hunt has

extolled it in *cancrum oris*—gangrenous stomatitis—given in solution, or divided doses, to the extent of from 20 to 60 grains in the twenty-four hours, according to the age of the child. It lessens—he says—the fœtor and salivation, and promotes the granulation of the sores. Dr. Watson states, that he has been in the habit of directing a solution of the salt in water, in the proportion of a drachm to the pint, as a drink for patients in scarlet fever, and in the typhoid forms of continued fever. The remedy was suggested to him by Dr. Hunt, who stated that he had long given it with advantage. Under the use of a pint, or a pint and a half, of the solution daily, Dr. Watson noticed, in many instances, a speedy improvement of the tongue, which, from being furred, or brown, or dry, became cleaner and moist. By Dr. Scruggs, of Germantown, Tennessee, the chlorate has been extolled both internally, and as a collutory in the erysipelatous inflammation of the mouth and fauces that occur in the “black tongue” of the Western States.. It has been considered, also, to be diuretic and refrigerant, and to resemble nitrate of potassa, than which it is probably not possessed of greater, or of other virtues. The dose is from ten grains to half a drachm. As a mouth wash, a drachm may be dissolved in four fluid-ounces of water. 

68. CAN'THARIS.—SPANISH FLIES.

Cantharides—elsewhere described (Vol. i. p. 281,)—have been occasionally prescribed internally in chronic cutaneous diseases—as lepra, psoriasis, chronic eczema, and squamous diseases of the skin. MM. Biett and Rayer recommend it strongly; but an objection to it is the irritation which it is apt to induce in the gastric and urinary organs. Its good effects are perhaps owing in part to the revellent influence thus effected; but they may also be dependent upon the modification induced by it on the blood, and through it on the morbid actions going on in the tissues. With this view, small doses, not exceeding a grain, two or three times a day, in the form of pill; or ten or fifteen drops of *Tinctura cantharidis* may be given.

69. SACCHARUM.—SUGAR.

The main properties of sugar were described in the first volume of this work, under DEMULCENT EXPECTORANTS, (p. 247). It is as an agent, capable of modifying the functions of nutrition, that it has now to be regarded; and the author is prepared to say, from an experience of many years, that it is one of the most important for this purpose that we possess. In the first edition of his “General Therapeutics,” (1836,) he stated, that in many forms of cachexia he had succeeded in producing a thorough revolution in the system of nutrition, by allowing the patient a certain quantity of sugar, formed into syrup, and given to the adult in such quantity, that three or four ounces of the sugar might be taken daily, and for a long period;—five or six weeks at the least. Under this diet or medicine,—for it is better, in order to infuse confidence, to give it as medicine, and to medicate it by the addition of a

little rose-water, or some aromatic oil,—the patient has rapidly gained weight, and the action of the system of nutrition has been so much changed, that the cachexia, induced by poor living, and a residence in confined unhealthy situations, as well as that which characterizes atrophy without any manifest cause, has been removed; a complete renovation has taken place; inveterate cutaneous diseases have disappeared, and old ulcers have filled up, and cicatrized. The sugar, in these cases, appears to act as a *substantive* and *adjective* aliment,—that is, it furnishes a richer and more abundant chyle; and, moreover, like a condiment, puts the digestive organs in a condition to derive a larger quantity of nutriment from the food than they would otherwise do. It is in consequence of this altered condition of the circulating fluid, that the action of the vessels of nutrition into which it passes is modified; and the pathological catenation that constitutes the cachexia is broken in upon. If sugar be added to venous blood out of the body, it changes it to a bright arterial hue.

When the functions of nutrition are morbidly affected, as in chronic cutaneous eruptions, there are two great methods in which we may reach the disease,—the one is by the application of external remedies to the diseased capillaries,—the other, by changing the impression made upon them internally by the fluid that circulates within them. Sugar—like arsenic, creasote, iodine, and other eutrophics—acts in the latter way. The great success which the author has met with in the removal of inveterate eruptions from the administration of sugar, has induced him to infer, that many of the alterative syrups—officinal and empirical—may be mainly, and some of them wholly, indebted for their efficacy to the sugar which they contain; especially as he has not noticed the same good effects, when the other ingredients of many of these syrups have been given without the sugar.

In the number of the *American Medical Intelligencer* for April 15, 1837, he published the case of a lady, from a distant city, who visited Philadelphia to place herself under the care of an eminent professional friend, who advised her to consult the author. Four years previously, her husband, who was a dissolute character, had contracted syphilis, and communicated it to her. She had applied to several physicians; but without experiencing much relief. Ulcerations existed on various parts of the body. There were nodes on the tibia and forehead; added to which she had been unable to sleep, in consequence of severe pains in the bones, for the eighteen months prior to her arrival in Philadelphia. In order that full opportunity might be afforded for her recovery, she took a house; had her furniture sent to her, and determined to reside during the winter in Philadelphia. She had already taken various forms of mercurials, and amongst the rest, corrosive chloride of mercury, in the use of which she had persisted for a long time. It was, however, directed again by the author, so that she should take one-sixteenth part of a grain three times a day; and in addition to this, she was ordered to dissolve a pound of rock candy in a pint of water, and take a wine-glassful four times a day. Under this course, the ulcers soon began to heal; the nodes disappeared; the pains in the bones ceased; her nights were passed in comfort; and at the end of five weeks, she was so much

restored, that she determined to rejoin her family; quitted her house; removed her furniture, and went away with feelings of perfect recovery. She was recommended, however, to persevere in the plan advised. Since then, the author has not heard from her.

Many similar cases have occurred to the author in which he has found the eutrophic influence of the saccharine treatment most signally manifested. The remedy, however, is so simple, that it may be difficult to induce practitioner or patient to place much confidence in it; but if the former will reflect upon the indications which he desires to fulfil, and on the effect which sugar is capable of inducing, like other eutrophics whose properties have been considered, he ought not to hesitate to prescribe it, and the result will gratify, and, in many instances, astonish him. At the recommendation of the author, it has been prescribed by several physicians, and with results analogous to those he has depicted. A case of almost hopeless cachexia in a child has been published by Mr. Rowbotham in the London *Lancet*, in which a diet of fruits and saccharine matter,—as honey, sugar and treacle—"snatched from the grave, and from a state, which perhaps no mortal was ever in before, and restored to health and life;" and according to the *British and Foreign Medical Review*, for Oct. 1842, a treatise on rheumatic diseases had appeared at Leipzig in 1841, by Dr. Greiner, in which there is a "warmth of eulogium on sugar as one of the direct means of improving the blood," which "somewhat surprised" the reviewer. Dr. Greiner, it appears, strongly recommended it in both acute and chronic rheumatism, where sthenic excitement prevails, and antiphlogistic means are indicated; but to be useful—he states—it must be taken in doses of from one to two ounces, three or four times daily, in syrups, conserves,—or plain.

In the different diseased conditions for which the author administers it to modify the action of the system of nutrition, he is in the habit of recommending it in the form of syrup—either the officinal syrup of the pharmacopœia, or one made extemporaneously by dissolving a pound of rock candy in a pint of water. Of this, a wine-glassful may be taken three or four times a day, between meals, and the quantity be gradually increased. It is proper, that the individual should take animal food along with it, otherwise scorbutic cachexia may be induced; but the quantity of vegetable food must be diminished. The only accident that is apt to arise during its administration is diarrhœa; which soon, however, passes off, if the sugar be discontinued for a short time.

It need scarcely be said that in morbid states, that have endured for a length of time, no great benefit can be derived excepting from a long persistence in the use of any remedy. Accordingly, much effect may not be perceived until four or five weeks have elapsed, when, if advantage is to be derived, it will begin to appear.

70. SARSAPARIL/LA.

This much employed root is referred, in the United States' Pharmacopœia, to *Smilax officinalis*, and other species of *Smilax*; SEX. SYST. Diœcia Hexandria; NAT. ORD. Smilacæ; a genus of creepers growing

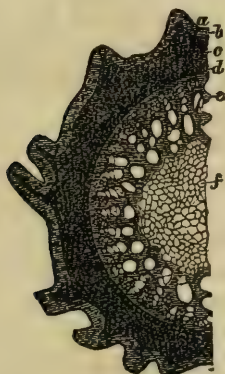
on moist river banks and woods in the hotter parts of North and South America, especially in Mexico, Columbia, Guiana, Brazil, and the Southern States of the Union. At least three species seem to be made out as furnishing the sarsaparilla or *sarza* of commerce:—1. *Smilax officinalis*, which grows in New Granada, on the banks of the Magdalena, and is transmitted in large quantities to Carthagen and Mompox, whence it is shipped to Jamaica and Spain. 2. *Smilax syphilitica*, which was found by Humboldt and Bonpland in New Granada, and by Von Martius in the Brazils, and which is exported to Europe from the ports of Brazil. 3. *Smilax medica*, which grows on the Eastern slope of the Mexican Andes, and is carried to Vera Cruz and Tampico for exportation.

There are still other species of *smilax*;—for example, *Smilax sarsaparilla*, which is a native of the Southern States; but there is no evidence that it yields any of the sarsaparilla of the shops; and the root would assuredly be dug up, and introduced into the market, if it had been found to possess the same properties as the imported article. (Wood and Bache.) Another species has been mentioned by Pöppig, under the name *Smilax cordato-ovata*. It grows in Brazil, and supplies, in that country, a part of the root which is used in medicine. All the species of sarsaparilla plant have a rhizoma, which sends out numerous long horizontal roots or runners, and these roots constitute the sarsaparilla of the shops.

Several varieties of sarsaparilla are met with in European commerce, all of which have been described by recent pharmacologists. Of these, the most important are the following:—

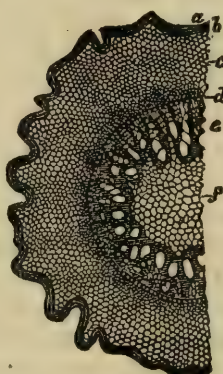
1. JAMAICA SARSAPARILLA, *Red*, or *Red-bearded Sarsaparilla*, which is probably the root of *Smilax officinalis*, and is made up in bundles of about a foot, or a foot and a half long, and four or five inches broad, the

Fig. 161.



Jamaica Sarsaparilla.

Fig. 162.



Honduras Sarsaparilla.

a. Cuticle. b. Subcuticular tissue. c. Hexagonal cellular tissue. d. Cellular ring.
e. Woody zone. f. Medulla. The hexagonal cellular tissue abounds in starch.—(Christison.)

roots scarcely equalling in thickness a goose-quill, and distinguished from the other varieties by the red colour of the epidermis. It receives the name Jamaica sarsaparilla, owing to its being sent thither from Honduras. Occasionally, it is exported from Guatemala. This is the most

esteemed variety in English pharmacy. 2. HONDURAS SARSAPARILLA, *Mealy Sarsaparilla*, is exported directly from Honduras Bay, and some of it scarcely differs from Jamaica sarsaparilla. Generally, the roots are folded, and formed into bundles two or three feet long, in which roots are found of inferior quality, with stones, pieces of wood, &c. The colour is dirty or grayish-brown. The epidermis is thin, and within it is a thick, white, amylaceous layer, which gives it a mealy appearance when broken,—whence one of its names. Its botanical source is not accurately determined. It is the variety most commonly used in this country. 3. BRAZIL SARSAPARILLA, *Lisbon, Portugal, Rio Negro sarsaparilla*, strongly resembles the last variety in form, colour, and mealiness; but it is generally exported unfolded, and tied in cylindrical bundles, three to five feet long, and about a foot in diameter. It has fewer radicles or rootlets than either of the other varieties. It is supposed to be the produce of *Smilax syphilitica*, and perhaps, also of *S. ovato-cordata*, and is exported from Maranhão chiefly. Being sent to Portugal, and especially to Lisbon, it obtains a name from those places. 4. LIMA, or VALPARAISO SARSAPARILLA was originally exported from Lima, but is now frequently obtained from Valparaiso; and at times from Costa Rica. Dr. Pereira states, that he knew of one importation of 99,000 lbs. from the last place. It is an inferior variety, commonly imported in large bundles, and resembles somewhat the Jamaica or Honduras variety. It is imported folded in bundles of about three feet long and nine inches in diameter, with the rhizoma or *chump* in the interior of the bundle. Its colour is brown or grayish-brown. Its botanical source is not known; but it has been presumed to be from *Smilax officinalis*. 5. VERA CRUZ SARSAPARILLA indicates by its name the place whence it is exported; but it is said not to be often met with. The roots are not folded, and have the rhizoma or *chump* attached. They are thin; tough; of a light grayish-brown colour, and devoid of starch in the cortex. It is the produce of *Smilax medica*.

Besides these chief varieties, other minor sarsaparillas are described by pharmacologists, but they are not of much interest to the physician. *Smilax China*, *China root*, a native of Japan, has been employed in the same cases as sarsaparilla.

As met with in the shops, sarsaparilla is almost devoid of odour, but possesses a mucilaginous slightly bitter taste, and, when chewed for some time, causes a sensation of acidity in the mouth and fauces, which persists for a considerable period. According to Dr. Hancock, the Rio Negro sarsaparilla, which in his opinion is the only kind that possesses any activity, has a peculiar nauseous acrimony, which no other sarsaparilla possesses; but if Dr. Hancock be right, large quantities of the other varieties, which are alone prescribed by many physicians—who are notwithstanding ready to depose to its valuable properties—must have been devoid of action on the economy; and if, as has been thought, the root is efficient in proportion as it possesses the acrimony described above, which is said to be a volatile, easily destructible principle, then almost all the preparations, so long given, and implicitly relied on by many, must—as regards the sarsaparilla—have been wholly inoperative. Such might be the case with *Decoctum sarsaparilla*

compositum, and *Syrupus sarsaparillæ compositus* of the Pharmacopœia of the United States, and with the decoctions and extracts of other pharmacopœias in which heat is employed. According to Dr. Hancock, if the sarsaparilla be really of good quality—which, however, he adds, is very seldom the case with what is to be got in Europe—the only correct preparations of it are—an infusion of the bruised root made by keeping it for some hours at 212° without boiling; and one prepared slowly without heat at all.

These facts would of themselves throw strong doubts in regard to much of the testimony that has been brought forward in favour of this article of the *Materia Medica*; nor is any light thrown on the subject by the investigations of the chemical analyst. It has been repeatedly examined; but discrepant statements of its composition have been the result. It seems to contain *Volatile oil of sarsaparilla*, which has the odour and acrid taste of the root; *Smilacin*, called also *Pariglin*, *Sal-separin*, and *Parallinic acid*, which appeared to Palotta to act as a sedative in doses of two to thirteen grains; resin, and extractive—on which it has been thought a part at least of the medicinal properties depend, and starch. Smilacin is procured by decolorising a concentrated hot alcoholic tincture of sarsaparilla by animal charcoal. On cooling, the tincture deposits impure smilacin, which can be purified by repeated solution and crystallization.

The active principles of sarsaparilla reside chiefly in the cortical portion. They are imparted to water and dilute alcohol.

The quantity consumed is very great. In the year 1840, duty was paid in England on 121,814 lbs.; and the countries from which it was obtained in 1831 are thus stated by Dr. Pereira from a parliamentary return:—

Portugal,	16,110 lbs.
Italy and the Italian Islands,	107
British Northern Colonies,	71
British West Indies,	45,063
United States of America,	29,122
Mexico,	43,254
Guatemala,	14
Brazil,	31,972
Peru,	11,141
<hr/>	
Total import,	176,854
Returned for home consumption,	107,410

Dr. Christison quotes the statement of Dr. Pereira in regard to the quantity consumed in Great Britain in 1831; and adds that in 1821 the apothecary of one of the great London Hospitals informed him, that he had paid at that time £1,500 for a single year's consumption of it.

In April 1849, Dr. Bailey, inspector of drugs at the port of New York, rejected 1450 lbs. of Sarsaparilla from Tampico.

Were we to be guided by the quantity consumed, sarsaparilla ought
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to be esteemed a most valuable therapeutical agent; yet the author has much difficulty in speaking positively on the subject. Were he to judge from the results of his own observation, he would say, that it is inert; and a consideration of the remarks already made in regard to the different varieties of the drug, and forms of preparation, would tend to a similar conclusion; yet when he observes so many persons offering their testimony in its favour, he is not prepared to decide, as Dr. Cullen did, that it is totally devoid of medicinal efficacy. Much, doubtless, is to be ascribed to the diet and regimen generally associated with it; much, in syphilitic and syphiloid diseases, to its frequently leading to the exclusion of mercury; and much, the author is disposed to think, to the substances that are associated with it. "No doubt"—say Messrs. Ballard and Garrod—"chronic cutaneous affections, glandular swellings, enlargements and painful diseases of the joints, bones, fasciæ, &c., sometimes disappear under its use; but still we must suspend our judgment respecting the part which it takes in their *cure*, until the influence of time, regulated diet, and other medicinal agencies usually combined shall have been correctly ascertained.

In public and in private practice, the author has carefully watched the effects of sarsaparilla, given singly, in infusion and in extract, but he is not prepared to say that he has, in a single instance, observed effects that could be fairly referred to it. Such has not been the case when syrup of sarsaparilla has been exhibited largely; but here a considerable quantity of saccharine matter was taken along with it, to which the author is disposed, for reasons elsewhere given, to refer the therapeutical agency. The remark of Mr. Lawrence, that physicians have no confidence in it, but surgeons a great deal, is not sufficiently explained by the circumstance mentioned by Dr. Pereira, that physicians are much less frequently called in to prescribe for those forms of disease, in the treatment of which surgeons have found sarsaparilla so efficacious. Moreover, Dr. Christison remarks, that if the fact be applicable to London, it does not apply elsewhere, and not to Edinburgh certainly, where some of the most eminent surgeons have abandoned it except as a *placebo*. "My own opinion," he says, "deduced from not unfrequent opportunities of practice in the Edinburgh Infirmary, where syphilitic and mercurio-syphilitic cases come under the cognizance of the physician chiefly, is, that the question—confessedly a difficult one, like that relative to the action of alterative remedies in general—is still far from being satisfactorily decided; that more careful observations are required, more especially in reference to the now acknowledged efficacy of simple non-mercurial treatment in secondary, pseudo, and mercurial, syphilis; and that the probability is much in favour of the drug turning out very inferior in virtue to what its admirers imagine;" and he adds, that the question is not unimportant in an economical point of view, seeing that so much of it is consumed.

Perhaps there is no article of the *Materia Medica* which is employed so lavishly, and so frequently had recourse to in chronic diseases, when the practitioner is in doubt what to do. As a eutrophic, it has been chiefly had recourse to in cachexia of various kinds, but especially in the syphilitic; and is, at times, associated with mercury, especially with

the corrosive chloride. When employed alone, it offers an exemplification of the *simple* mode of treating syphilis, in contradistinction to the *revellent* by mercury, iodine, &c.

It has, likewise, been freely given in syphiloid affections, and in chronic cutaneous diseases; and, in the form of syrup, has been frequently efficacious, in the last affections especially. Whenever, indeed, a modified action in the system of nutrition generally has appeared to be indicated, it has been prescribed.

It may be given in powder in the dose of $\mathfrak{z}\text{ss}$ to $\mathfrak{z}\text{j}$, three or four times a day; but it is not often prescribed in this form. When fresh, the root is said to induce nausea and vomiting; and signs of narcosis have resulted from it: but in the state in which it is met with in the shops, it rarely or never disagrees except from quantity. A fact, mentioned by Dr. Pereira, may render the practitioner cautious in prescribing the powder:—viz., that some druggists employ, in its preparation, the roots from which the extract has been obtained. This powder is, of course, almost devoid of taste.

INFUSUM SARSAPARIL/LÆ, INFUSION OF SARSAPARIL/LA. (*Sarsaparill. contus.* $\mathfrak{z}\text{j}$; *Aquæ bullient.* Oj ;—prepared either by maceration or by displacement with cold water.) The dose of the infusion is $\text{f.}\mathfrak{z}\text{iv}$ to $\text{f.}\mathfrak{z}\text{vj}$ two or three times a day.

DECOCTUM SARSAPARIL/LÆ COMPOSITUM, COMPOUND DECOCTION OF SARSAPARIL/LA. (*Sarsap. incis. et contus.* $\mathfrak{z}\text{vj}$; *Sassafras. incis.*, *Guaiac. lign. rasur.*, *Glycyrrhiz. contus.* $\text{āā } \mathfrak{z}\text{j}$; *Mezer. incis.* $\mathfrak{z}\text{iiij}$; *Aquæ Oiv.* Boil for a quarter of an hour and strain.) This preparation is an imitation of the *Lisbon Diet Drink*, which was long celebrated in all cases in which sarsaparilla was indicated;—its powers being enhanced—it was conceived—by the addition of the sassafras, guaiacum, and mezereum, which were supposed to possess analogous properties. If the objections made to the application of a boiling heat be well founded—as they are generally admitted to be—decoction must be an imperfect mode of preparation. The dose of this preparation is $\text{f.}\mathfrak{z}\text{iv}$ to $\text{f.}\mathfrak{z}\text{vj}$ three or four times a day. The syrup or extract is often associated with it.

SYRUPUS SARSAPARIL/LÆ COMPOSITUS, COMPOUND SYRUP OF SARSAPARIL/LA. (*Sarsaparill. contus.* $\mathfrak{z}\text{ij}$; *Guaiac. lign. rasur.* $\mathfrak{z}\text{iiij}$; *Ros. centifol.*, *Sennæ*, *Glycyrrhiz. contus.* $\text{āā } \mathfrak{z}\text{ij}$; *Ol. Sassafras*, *Ol. anisi* $\text{āā } \mathfrak{m} \text{ v}$; *Ol. gaultheriæ* $\mathfrak{m}\text{iiij}$; *Alcohol. dilut.* Ox ; *Sacchar.* $\mathfrak{z}\text{viiij}$. The first five articles are macerated in the alcohol for a certain length of time, and by means of a water-bath the filtered tincture is evaporated to four pints; to the filtered liquor the sugar is added, so as to form a syrup; the oils being added last. It may also be made by displacement, according to the formula in the United States Pharmacopœia.)

Dr. Christison considers the simple syrup of sarsaparilla to be “an unnecessary addition to the list;” and Dr. Thomson remarks, that it can be better and more easily supplied by rubbing up a few grains of the extract with some simple syrup. The preparations of the British College are probably inert as regards the sarsaparilla, as the boiling cannot

fail to destroy any virtues that it may possess. This objection does not apply so much to the process of the United States Pharmacopœia; yet, the heat of the water-bath may affect its virtues. The roses and volatile oils are added for the sake of flavour. There is no question whatever that this syrup has been productive of good effect in many cachexiæ; but the author is not prepared to say how much of this is ascribable to the sarsaparilla and guaiacum, and how much to the saccharine matter, which is sometimes given very freely. The ordinary dose is, however, f.ʒss to f.ʒj three or four times a day. It may be substituted for the *Sirop de Cuisinier*.

EXTRACTUM SARSAPARILLÆ, EXTRACT OF SARSAPARILLA. (Prepared, according to the Pharmacopœia of the United States, by displacement, by means of diluted alcohol and water, evaporating the filtered liquor to the proper consistence.) It is very questionable whether any extract of sarsaparilla can be possessed of much virtue. If the properties reside in volatile matter it must be driven off by the long coction. The Edinburgh and Dublin Colleges have a *Fluid extract of sarsaparilla*, in which the concentration is not carried so far. A little dilute alcohol is added to make it keep.

The dose of the extract of sarsaparilla of the Pharmacopœia of the United States is from ten to twenty grains, three or four times a day. Dr. Pereira, contrary to most observers, states his belief, that when the ordinary extract of sarsaparilla of the London and Dublin Pharmacopœias is properly prepared from Jamaica sarsaparilla, it is a most valuable and efficient remedy. He recommends, that, when given, it should be rubbed down with water, and flavoured by the tincture of orangepeel, or by some volatile oil, as oil of cloves, allspice, lemon or cinnamon. The author has used it extensively, but he cannot accord with that gentleman in his high appreciation of it.

Compound extract of sarsaparilla is kept in the shops. It is made by mixing with *Extract of sarsaparilla*, an *Extract of mezereon bark*, *Liquorice root*, and *Guaiacum shavings*, adding a small quantity of *Oil of sassafras*. Three quarters of an ounce of this to a pint of water are considered to equal in virtues a pint of the compound decoction of the British Pharmacopœias.

71. GUAIACI LIGNUM.—GUAIACUM WOOD.

The general properties of guaiacum wood have been described under **EXCITANT DIAPHORETICS**, (Vol. i. p. 319). As a eutrophic, it has been given, like sarsaparilla, in syphilitic and syphiloid diseases; and in most forms of cachexia. It is less relied on, however, than sarsaparilla, and is usually associated with it. It has also been freely administered in chronic cutaneous affections. It is probably possessed of very little efficacy.

There is no separate preparation of it in the Pharmacopœia of the United States; but the Edinburgh and Dublin Colleges have a **DECOC-TUM GUAIACI**, which is considered to be the relic of the old *Decoction of the woods*. In the pharmacopœia of the former, it is made as fol-

lows:—*Guaiacum trimmings* ʒiij; *Sassafras*, rasped ʒj; *Liquorice root* bruised ʒj; *Raisins* ʒij; *Water Ox*. Boil the guaiacum and raisins with the water to five pints, adding the liquorice and sassafras towards the close; then strain. The dose of this is f.ʒiv to ʒviij and more, three or four times a day.

Guaiacum wood enters into the composition of *Decoctum sarsaparillæ compositum*, and *Syrupus sarsaparillæ compositus* of the Pharmacopœia of the United States.

72. MEZE'REUM.—MEZE'REON.

Mezereon belongs, like guaiacum wood, to the excitant diaphoretics; and its general properties have, consequently, been described elsewhere, (Vol. i. p. 321). It is given in the form of decoction—*DECOCTUM MEZEREI* of the Edinburgh and Dublin Pharmacopœias, which is made as follows:—*Mezereon bark* in chips ʒij; *Liquorice root* bruised ʒss; *Water* Oij; boil gently to Oij. The dose is f.ʒiv to f.ʒviij, three or four times a day.

Mezereon enters into the same officinal preparations as guaiacum wood, and is seldom given alone.

73. ARA'LIA NUDICAULIS.—FALSE SARSAPARILLA.

This is the root of *Aralia nudicaulis*, *False sarsaparilla*, *Wild sarsaparilla*, *Small spike-nard*; SEX. SYST. Pentandria Pentagynia; NAT. ORD. Araliaceæ; an indigenous perennial plant, which grows throughout the greater part of the United States, flowering in May and June. It is officinal in the secondary list of the Pharmacopœia of the United States; is about as thick as the little finger; more or less contorted; of a yellowish brown colour externally; of a fragrant odour, and an aromatic saccharine taste.

Fig. 163.



Aralia nudicaulis.

False sarsaparilla has not been analyzed, but appears to possess properties that might entitle it to rank with guaiacum and mezereum amongst excitant diapho-

retics. The common belief is, that, like them and sarsaparilla, it may be employed also as a eutrophic in syphilitic and syphiloid diseases, and in chronic cutaneous affections especially. The author has never prescribed it, nor has he seen it prescribed.

The root of *Aralia racemosa*, *American spikenard*, is said to resemble *Aralia nudicaulis* in properties.

74. SAS'SAFRAS RADICIS CORTEX.—BARK OF SAS'SAFRAS ROOT.

This agent—like guaiacum wood and mezereon—was at one time supposed to be possessed of powerful eutrophic virtues, especially in syphilitic and chronic cutaneous diseases; and it is still associated with the articles above mentioned, and with sarsaparilla, in one officinal preparation of the Pharmacopœia of the United States, *Decoctum sarsaparillæ compositum*. Its properties—both diaphoretic (Vol. i. p. 323,) and eutrophic—are probably altogether dependent upon the volatile oil which it contains; but its agency is very limited, and it is now never given alone in the very cases in which it was formerly so much extolled.

Oil of sassafras forms part of *Syrupus sarsaparillæ compositus* of the Pharmacopœia of the United States.

75. DULCAMA'RA.—BIT'TERSWEET.

Bittersweet, of the Pharmacopœia, is the stalks of *Solanum dulcamara*, *Woody nightshade* or *Bittersweet*; SEX. SYST. Pentandria Monogynia; NAT. ORD. Solanaceæ;—a perennial climbing plant, which is common in Europe, and in this country, both wild and cultivated; flowering from June to August. The stalks—which are the only officinal portion—are collected in autumn, after the leaves have fallen off. When bruised in their fresh state they have a disagreeable odour, which is lost by drying. The taste is at first bitter, and afterwards sweet, which gives occasion to their name. As we meet with the dried stalks in the shops, they are rugous externally, having a greenish-gray epidermis, an interior light woody portion, and a central light and spongy pith.

It imparts its properties to water and to alcohol; but the tincture is never employed. It has been subjected to analysis, and found to contain a sweetish bitter extract—to which, from these qualities, the name *Picroglycion*, *Dulcamarin*, or bittersweet principle, has been given,—an alkaloid of narcotic properties, termed *Solania* or *Solanina*; besides other unimportant ingredients.

Bittersweet has been used in the same class of cases as sarsaparilla, mezereum, guaiacum and sassafras; and is probably not possessed of more powers than the feeblest of these. Were the author to be guided by the results of his own experience, he would say that it is almost devoid of action on the economy. He has seen it chewed by boys in large quantities; and has chewed it himself when a boy, without

observing any effect from it, except what was caused by its saccharine and gummy matter. The decoction, the extract and the fruit have all been given in large quantities, with no more effect; yet solania, which has been separated from it, is said to have killed a rabbit in the dose of two grains. Certainly, more testimony is needed, before it can be regarded as possessed of much efficacy; especially when we are told, by Chevallier, that an article, having, according to all, little or no narcotic power, occasioned narcotism in a young man, when he merely carried a bundle of it on his head! Dr. Wood of Philadelphia—who considers that its use is now nearly confined to the treatment of cutaneous eruptions, particularly those of a scaly character, as lepra, psoriasis, and pityriasis, in which he thinks it is often decidedly beneficial, especially when combined with minute doses of antimonials,—states, that he has observed, in several instances, when the system was under its influence, a dark purplish colour of the face and hands; and, at the same time, considerable languor of the circulation. Such effects have not been observed by the author, nor are they recorded by others; but whatever rests on the authority of Dr. Wood is deserving of consideration; and may lead to farther investigation. Dulcamara is given in the form of the officinal decoction; and is administered in all the cachectic conditions that require the employment of the vegetable agents last described. The cachexiæ in which it is now mainly prescribed, however, are those accompanied by chronic diseases of the skin.

DECOC'TUM DULCAMARÆ, DECOCTION OF BITTERSWEET. (*Dulcamar. contus.* ʒj; *Aquæ* Oiss, boiled to a pint.) The dose may be f.ʒij to f.ʒiv three or four times a day.

76. STILLINGIA, QUEEN'S ROOT.

Stillingia, in the secondary list of the Pharmacopœia of the United States, is the root of *Stillingia aquatica*, *Queen's delight*; SEX. SYST. Monœcia Monadelphia; NAT. ORD. Euphorbiaceæ, which grows in pine barrens from Virginia to Florida; flowering in May and June. It has been highly extolled by Dr. Thomas Y. Simons, of Charleston; who regards it as the best vegetable alterative known; and believes that it will ultimately supersede sarsaparilla, or be esteemed as a most useful adjuvant to it. With the views, which the author possesses in regard to the eutrophic virtues of sarsaparilla, he cannot consider this to be high praise.

It may be given in powder in the dose of fifteen or twenty grains. Or, an ounce of the bruised root may be boiled slowly in a pint and a quarter of water to a pint; and one or two fluidounces of this may be given three times a day. A tincture is sometimes made of two ounces of the root to a pint of diluted alcohol, the dose of which is a fluidrachm. Dr. Frost of Charleston thinks, that the active principle is somewhat volatile; and if such be the case, decoction must be an objectionable form of preparation.

77. JUGLANS CINEREA.—WALNUT.

The leaves of walnut have been highly extolled of late by M. Négrier as superior to all other antiscrofulous remedies. He found the extract of the leaves, which may be ranked in the class of slightly aromatic bitters, to be almost always efficacious in scrofulous affections, and in no case did it appear to exert any unpleasant action on the economy. Their efficacy is doubtless, however, overrated by him; and their main virtues would appear to be those of the aromatic bitter tonics.

78. MUDAR.

Under the name *Mudar* or *Madar*, a medicine was imported into Europe from India, which is the bark of the root of *Calotropis gigantea*, *Asclepias gigantea*; NAT. ORD. Asclepiadaceæ, which is a native of Hindostan, but has been introduced into the West Indies, where it is now naturalized. It appears to have been used in India in the same cases as sarsaparilla;—for example, in syphilitic and syphiloid diseases, chronic cutaneous affections, &c. The powdered root—mudar—is given in doses of from gr. iij to gr. x, three times a day, gradually increased until it induces some degree of nausea and vomiting. It is not employed in American practice.

79. HEMIDESMUS INDICUS.—COUNTRY SARSAPARILLA, (OF INDIA).

This plant, called also *Periploca Indica*, *Asclepias pseudo-sarsa*, *Indian* or *scented sarsaparilla*; NAT. ORD. Asclepiadaceæ, is likewise a plant of Hindostan, which has been erroneously referred to *Smilax aspera*. (Pereira.) The root has been employed as a substitute for sarsaparilla. It is given in *infusion*, (*Hemidesm. Indic.* ℥ij; *Aq. bullient.* Oj; to be taken in the course of the twenty-four hours.) The decoction, extract and syrup have been used; but the heat necessary for their preparation is said to injure the medicine. The author knows nothing of it from his own observation.

*Topical Eutrophics.*1. *Eutrophic Ointments.*

In the general remarks on eutrophics, it was stated, that there are various external agencies, which give occasion to modification in the functions of nutrition of a part, and which must, therefore, be regarded as belonging to this division of medicinal substances. Every local excitant is capable of effecting this to a greater or less extent; and hence the various excitant applications, that are made to ulcerated surfaces, and to chronic cutaneous affections, must be regarded as eutrophics,—for example, *Ceratum resinæ*, (i. 484;) *Ceratum resinæ compositum*, (i. 484;) *Ceratum sabinæ*, (ii. 265;) *Unguentum cantharidis*, (ii. 265;) *Unguentum creasoti*, (i. 499;) *U. cupri subacetatis*, (ii. 267;) *U. Gallæ*,

(ii. 123;) *U. hydrargyri*, (ii. 294,) *U. Hydrargyri ammoniati*, (ii. 299;) *U. hydrargyri nitratis*, (ii. 303;) *U. hydrargyri oxidi rubri*, (ii. 296;) *U. iodini*, (ii. 309;) *U. iodini compositum*, (ii. 310;) *U. mezerei*, (ii. 265;) *U. sulphuris*, (ii. 329;) *U. sulphuris compositum*, (ii. 329.)

There are a few officinal preparations which have not yet been described, and which belong to this division of the subject.

80. **UNGUENTUM PICIS LIQUIDÆ, TAR OINTMENT.** (*Picis liquid.*, *Sevi*, āā ſſj melted together.) This ointment is a common application in chronic cutaneous affections, especially in porrigo and psoriasis. It may be applied several times in the day;—the good effects of most ointments of the kind being greatly dependent upon their repeated application.

OIL OF TAR, obtained from tar by distillation, is sometimes used in the same cases.

81. **UNGUENTUM TABACI, TOBACCO OINTMENT.** (*Tabac. recent. concis.* ʒj; *Adipis* ſſj. The tobacco is boiled in the lard until it becomes friable, and is then strained.) This ointment is officinal only in the Pharmacopœia of the United States. It is used on account of its sedative properties in irritable ulcers; but it is also employed in various chronic cutaneous diseases, especially in scald head. Great caution is, however, needed, inasmuch as the constitutional effects of the remedy may be induced by the topical application. (See *Tabacum*, Vol. i. p. 135.)

82. **UNGUENTUM VERA TRI ALBI, OINTMENT OF WHITE HELLEBORE.** (*Veratri albi pulv.* ʒij; *Ol. limon.* ℥xx; *Adipis* ʒviiij.) On account of the disagreeable qualities of sulphur ointment, this preparation is substituted for it in cases of scabies; but it is by no means so effective; and it is affirmed, that when applied to raw surfaces, danger exists of the system being affected by the absorption of the poisonous principle—*veratria*, (Vol. ii. p. 192). Hence, especial care is needed when this or the last preparation is given to children.

83. **UNGUENTUM ZINCI OXIDI, OINTMENT OF OXIDE OF ZINC.** (*Zinci oxid.* ʒj; *Adipis* ʒvj.) This ointment is frequently used as a mild application to various chronic cutaneous diseases, as well as in cases of ophthalmia, especially the form which affects chiefly the tarsus. It is often applied, also, to excoriations; and occasionally as a dressing to ordinary ulcers, although not by any means as frequently as the

84. **CERATUM ZINCI CARBONATIS, CERATE OF CARBONATE OF ZINC.** (*Zinci carbon. præparat.*, *Ceræ flavæ* āā ſſss; *Adipis* ſſij.) This is an imitation of an old and popular dressing for ulcers, recommended by Turner, and termed generally *Turner's cerate*. It is commonly used as a 'healing salve;' and is applicable to the same cases as *Unguentum zinci oxidi*.

ZINCI CARBONAS, CARBONATE OF ZINC, is the native impure carbonate,

commonly called *Lapis Calaminaris* and *Calamine*. **ZINCI CARBONAS PRÆPARATUS**, PREPARED CARBONATE OF ZINC, *Prepared Calamine*, is made by heating carbonate of zinc to redness, and afterwards pulverizing it in the same manner as prepared chalk.

85. **CERATUM PLUMBI CARBONATIS**, CERATE OF SUBACETATE OF LEAD. (*Liq. plumbi subacetat.* f.℥iiss; *Ceræ albæ* ℥iv; *Ol. Oliv.* f.℥ix; *Camphor.* ℥ss.) This is the old *Ceratum Saturni*, *Goulard's Cerate*, which has been most commonly used as a cooling dressing to wounds and ulcers; as a dressing to burns, scalds, and blistered surfaces; and likewise, as an application to irritable cutaneous diseases. The following ointment is used in similar cases.

86. **UNGUENTUM PLUMBI CARBONATIS**, OINTMENT OF CARBONATE OF LEAD. (*Plumbi carbon.* in pulv. subtiliss. ℥ij; *Unguent. simplicis* ℥j.)

2. Compressing Eutrophics.

The effects of compression in modifying the function of nutrition have been referred to in the general considerations on eutrophics. This is accomplished either by appropriate bandages methodically applied—*methodical compression*, as it has been termed; or by adhesive plasters. Of the latter, the following are generally used.

87. EMPLASTRUM PLUMBI.—LEAD PLASTER.

Lead plaster, *Litharge plaster*, *Diachylon*, is made by boiling *semi-vitrified oxide of lead* or *litharge*, in very fine powder, with *olive oil* and *water*, until the oil and oxide of lead unite into a plaster. The water appears to be necessary to favour the union of the oleic and margaric acids with the oxide of lead,—the plaster itself seeming to be a mixture of oleate and margarate of lead.

It is the most unirritating of adhesive plasters, and can be borne by those on whom *emplastrum resinæ* excites great irritation. It is much used by the surgeon in cases of wounds, to bring the edges together and protect the parts from the air, and to exert methodical compression in cases of ulcers, tumours, &c., and of orchitis and other inflammations in which it is desirable to employ pressure. It is by no means, however, as adhesive as the next plaster, which is, accordingly, more employed for the formation of *strapping*.

88. EMPLASTRUM RESINÆ.—RESIN PLASTER.

(*Resin. pulv.* ℥ss; *Emplastr. plumbi* ℥iij; melted together.) The resin occasions this plaster to be more adhesive; and hence its common name of *Adhesive plaster*. It is used for the same purposes as *Emplastrum plumbi*. It sometimes irritates the skin so much as to occasion excoriation and ulceration. In such cases, lead plaster has to be substituted.

Besides the above plasters, there are some others that are employed

as "*discutients*," to dispel morbid growths, either of the integuments or of internal organs. In both cases, they act as eutrophics,—modifying the nutrition of the part with which they are placed in contact,—partly by pressure, and partly by exciting a new action in the system of nutrition. In cases of internal tumours, their main efficacy is probably in the latter mode. The officinal plasters employed as discutients are the following:—

89. EMPLAS'TRUM AMMONIACI.—AMMONIAC PLASTER.

(*Ammoniac.* ℥v; *Aceti Oss*; made into a plaster by solution, and evaporation). The therapeutical properties of ammoniacum have been described elsewhere, (Vol. i. p. 230). This plaster is excitant, and is much used as a discutient in scrofulous and other tumours. It is often prescribed by the surgeon, 'as a very useful application to the housemaid's swollen knee.' (Pereira.) It occasionally excites considerable irritation of the cutaneous surface, and has to be removed.

EMPLASTRUM GALBANI COMPOSITUM, (Vol. i. p. 407,) and EMPLASTRUM HYDRARGYRI, (Vol. ii. p. 295,) are used in analogous cases.

The following plasters are employed chiefly to give support; but they may also act as discutients.

90. EMPLAS'TRUM FERRI.—IRON PLASTER.

Iron plaster, Emplastrum roborans, Strengthening plaster was long supposed to give tone by virtue of the iron which it contains. It is composed of *Subcarbonate of iron* ℥ij; *Lead plaster* ℥ij; *Burgundy pitch* ℥ss. It is questionable, however, whether the iron be of any advantage. This plaster gives support to weakened parts; and, by the new action which it excites in the vessels of the skin, it may be serviceable in dispersing tumours. The simple Burgundy pitch plaster possesses probably all its virtues.

91. EMPLAS'TRUM SAPO'NIS.—SOAP PLASTER.

(*Sapon. incis.* ℥ss; *Emplastr. plumbi* ℥ij). This plaster is frequently applied to tumours of various kinds as a discutient; and likewise to afford mechanical support. The same may be said of

92. CERA'TUM SAPO'NIS.—SOAP CERATE.

(*Liquor plumbi subacetat.* Oij; *Saponis* ℥vj; *Cera albæ* ℥x; *Ol. oliv.* Oj; made into a plaster by proper evaporation and admixture.

3. Eutrophic Liniments.

It was before remarked, (Vol. ii. p. 285,) that many of the liniments—those which are wholly oleaginous—are indebted for their eutrophic virtues to the rubbing; and that friction with the dry hand, methodi-

cally used, is capable of accomplishing whatever liniments can. Some of them, however, contain exciting ingredients, which enable them to act as revellents; but there is this objection, that friction with them cannot be sufficiently long continued; for it is an important matter, whenever a liniment is directed to remove any morbid formation or exudation, that the friction should be continued as long as the skin will well bear it; and, as before mentioned, under such circumstances, friction even with the dry hand dipped in flour is capable of producing surprising results.

The official liniments, most frequently had recourse to as discutients, are the following:

93. LINIMENTUM CAMPHORÆ.—CAMPHOR LINIMENT.

(*Camphor.* ℥ss; *Ol. oliv.* f.℥ij.) This is frequently used in glandular and other swellings; the camphor communicating excitant properties to the oil.

94. LINIMENTUM SAPO'NIS CAMPHORA'TUM.—CAMPHORATED SOAP LINIMENT.

(*Sapon vulgar.* ℥ij; *Camphor.* ℥j; *Ol. rosmarin.*; *Ol. origan.* āā f.℥j; *Alcohol.* Oj.) This is well known under the name *Opodeldoc*, and is used as an application to sprains, bruises, and as a revellent in cases of rheumatic pains. Where there is much effusion of fluid in the first cases, the friction occasions its absorption. The camphor and essential oils communicate excitant properties to it. It is rubbed on glandular swellings to promote their discussion.

95. TINCTURA SAPO'NIS CAMPHORA'TA.—CAMPHORATED TINCTURE OF SOAP.

(*Saponis.* rasur. ℥iv; *Camphor.* ℥ij; *Ol. rosmarin.* f.℥ss; *Alcohol.* Oij.) This is the *Soap liniment* of the shops. It is much used in the same cases as the last preparation.

96. ELECTRICITY, GALVANISM, ELECTRO-MAGNETISM.

ACUPUNCTURE and GALVANOPUNCTURE, considered under EXCITANTS, (Vol. i. 510,) act also as local eutrophics. The last has been highly recommended by Dr. Shuster, who maintains, that "galvanic electricity and the electro-magnetic fluid, when employed by acupuncture, constitute at once the most powerful and inoffensive medicinal agents that we possess." He recommends it in hydrocele, ascites, (idiopathic or symptomatic of curable lesions,) hydrothorax, and articular dropsies; and thinks its use may be extended to chronic hydrocephalus, dropsy of the pericardium, and the greater part of dropsical effusions;—also to lipomatous, steatomatous, atheromatous and melicerous tumours; to serous and synovial cysts; congestions and indurations,—chiefly those of the lymphatic glands, of the testes and epididymis; indurations of the areolar tissue; in the vicinity of certain kinds of ulcers; to the parietes of fistulous tracts; certain indolent tumefactions—and he con-

ceives there would be nothing irrational in attacking cancerous affections in the same way,—and lastly to goûté.

There can be no doubt, that the function of nutrition may be modified by these excitants, and that, in some of the cases mentioned, a marked sorbefacient agency may be exhibited.

SECTION VII.

AGENTS WHOSE ACTION IS PROMINENTLY CHEMICAL.

THE agents, which have thus far been considered, produce their effects altogether by the impression they make on the vital properties of the tissues. It is on this account that the epithet *vital* has been applied to them. Those, which have to be examined under this division, act chemically upon the substances with which they come in contact; and, in this manner, they may modify the vital properties indirectly. There are some, likewise, that effect chemical changes on parts endowed with vitality, and in this way produce as marked an influence on the vital manifestations, as many of the agents to which the epithet *vital* is attached.

The author has before observed, that so long as the tissues, which compose the body, are possessed of vital endowments, they resist the changes that would inevitably occur, were this influence withdrawn. The animal body is composed of materials, which are extremely prone to decomposition; but, so long as it is alive, the tendencies to change are controlled by the force of life, so that putrefaction cannot take place. In like manner, a resistance is presented by it to the influence of chemical agents, unless these agents are in such concentration as to be powerful irritants, or to disorganise the parts with which they are brought in contact. But this resistance is only within certain limits. We have most unquestionable evidence that changes may be effected, even in the circulating fluid,—changes which are palpable to the senses; and we must consequently admit, that if modifications can be produced chemically in a fluid, whence every tissue of the body is formed, a greater or less change may be occasioned in those agents whose function it is to form such tissues, and by which the functions of calorification and secretion are accomplished.

Of the changes, produced in the blood by chemical agents, we have marked examples in the different tints occasioned by exposing it to various gases; as well as in the appearance which that fluid presents after certain solutions have been thrown into the veins. It has been said, indeed, that any one, who believes in such changes, must consent to be ranked amongst the humoral pathologists,—the beings of a bygone period; but this reproach, at the present day, has lost all its terrors. Pathologists have discovered, that in flying from *humorism* to *solidism*, they have, as in all similar cases, wandered from the paths of true

observation; and they have exhibited the triumph of judgment and candour over folly and prejudice, by amalgamating the two doctrines, where amalgamation was practicable; and rejecting from each such views as had not borne the test of experience and reflection. The present period may be termed eminently eclectic; for, although exclusives occasionally arise amongst us, they are rare; and have—when we take the world at large—but few followers. Many of those, too, who would blush to be esteemed humourists, still believe in *critical discharges*, and *efforts of nature*, although they would, at the same time, spurn the idea, that any substance could get into the blood, without occasioning the most disastrous results. Yet the phenomena of exanthematous fevers must be, with such individuals, a source of intense difficulty. In any view of the subject, they are sufficiently difficult of explanation; but, in the one we are canvassing, the difficulties are overwhelming. In smallpox inoculation, a minute portion of variolous matter is inserted under the cuticle,—brought in contact, in other words, with the corpus papillare, and with the divided vessels of that body; and we can predict that, in a proper subject, a fever will break out in a certain number of days after inoculation; and that after a definite period an eruption will make its appearance, which will go through its regular stages of increment, maturation and declension, leaving the patient, after a time—which, in favourable cases, equally admits of prognostication—well. It is assuredly not easy to conceive how this extensive secretion of morbid poison can take place, without presuming, that the action of the system of nutrition has become modified by the condition of the circulating fluid; and that this fluid has had its condition changed by the reception of the variolous matter into it. Still, although we admit this, there is much to be explained,—both as regards exanthematous fevers and those that are unaccompanied by cutaneous affections.

Of late years, a much greater degree of attention has been paid to morbid conditions of the blood, and to the effects of therapeutical agents upon it; and now, that the horror of the humoral pathology has abated, and indeed almost vanished, fresh investigations are made into its varying condition in disease, and into the best methods for restoring it to the healthy state.

In the case, assumed above, the smallpox taint must evidently have been received into the blood, and by the action of this fluid on the capillaries, and on the nerves distributed to them, the exanthematous fever resulted. In other cases, the capillaries and the nerves connected with them may be first morbidly impressed; and, successively, the condition of the circulating fluid may be modified. Of this we have examples in all the active hyperæmiæ, and in every febrile irritation which is the consequence of derangement in any portion of the intermediate system of vessels. In one or other of these modes, all fevers—miasmatic or common—are probably induced.

The different classes of chemical remedies are not all as important as certain of the divisions of vital agents, that have been considered. Yet some of them are deeply interesting, although generally but little understood by the student, in consequence of their consideration seem-

ing to require a greater amount of chemical knowledge than is actually the case.

When iodide of iron or creasote is added to blood out of the body, it coagulates the albumen of the blood, and renders it solid; and when administered therapeutically, it is probable, that effects somewhat analogous may be produced on the blood whilst circulating in the vessels, and that, by increasing its tendency to coagulate, these may be efficient agents in scurvy, and in hemorrhages, especially of the passive kind. (See Vol. ii. p. 62.)

Certain chemical agents operate altogether upon the contents of organs, in the same manner as if they were placed in contact with such contents out of the body; and it is, therefore, but necessary to know the chemical character of those contents to adapt the remedy accordingly. This is the case with antacids. Others, again, as disinfectants or antiseptics, are of more complex operation.

Escharotics,—defined to be ‘agents, which destroy the vitality of the part to which they are applied, and erode or decompose the animal solid,’—are ranked by therapeutists under this division; but as they are often employed to exert their effects upon distant parts of the organism, in the same manner as epispastics in general, the author considered it advisable not to separate the discussion of their operation, as chemical agents, from that of their dynamic or vital. It will, consequently, be unnecessary to recur to them under this division.

1. ANTACIDS.

Definition of antacids—Great generation of acid in dyspepsia—Acids always in the healthy stomach—Morbid acidity, how induced—Predominance of acidity in children—Antacids only palliatives—Special antacids.

THESE may be defined—“Agents, that obviate acidity in the stomach or elsewhere, by combining with the acid, and neutralizing it.”

Where acids are present in the stomach, antacids affect them as they would out of the body; but where conditions exist, which are dependent upon the formation of acid elsewhere than in the stomach, or where the acid has to be acted upon through the medium of the circulation—as in the calculous diathesis, of one kind, before referred to, (Vol. i. p. 298,)—the precise *modus operandi* is not so simple. We should hardly be right, perhaps, on this account in deducing, that the whole operation of antacids is of a purely chemical character. Although their immediate action may be such; they may likewise, when taken into the circulation, so modify the action of the organs concerned in nutrition as to produce an alteration even in the tissue of organs; and, along with change of air and other physical and moral influences, be the means of restoration to health, where the gouty or lithic acid diathesis exists.

The generation of an unusual quantity of acid in the stomach is one of the most ordinary symptoms of dyspepsia. It is indicated by

acid eructations; violent heartburn; and marked effervescence, when a carbonated alkali is taken;—the acid, in the stomach laying hold of the alkaline base, and the carbonic acid being given off in such quantity, occasionally, as to sting the nose,—much in the same manner as champagne or any brisk fermented liquor does.

In a state of health, two acids are always present in the stomach, after food has been received into the organ, or indeed when any substance—not entitled to the name of *aliment*—is present there. They are the chlorohydric or muriatic, and the acetic; and the quantity of the latter is considerable. Now, if these acids accumulate from any cause, they may give rise to all those signs, that indicate the existence of an undue quantity of acid in the organ. In such case an antacid can obviously only palliate the symptoms, although it may do this successfully for the time. From an early period of life, the author has been very subject to this painful affection,—so much so, that he has generally carried a carbonated alkali about with him,—and although, after errors in regimen, the suffering has occasionally been to such an extent as to approach vomiting, in no instance has he failed to allay the uneasy sensation by an adequate quantity of the alkali; and it has not usually been necessary to repeat the dose.

To effectually remove the complaint, we must inquire narrowly into the causes that may have occasioned the unusual generation of acid, and attack them; the presence of acid, in undue quantity, can only be regarded as the symptom of some morbid condition. Now, we observe heartburn under two very opposite aspects. In one, the lining membrane of the stomach is inflamed, and we have a true case of chronic gastro-enteritis: in the other, there is sufficient evidence of the different functions being affected asthenically. In the *former* state, the organs, whose office it is to secrete the gastric fluid, are inordinately excited, and this excitation has to be allayed by the appropriate employment of depletives and revellents: in the *latter*, we have to remove the atonic condition of the mucous and muscular coats, which gives occasion to the too long detention of the food in the stomach, and to a tardy action of the gastric secretions and functions upon it.

A want of attention to the existence of these two pathological conditions, which give rise to very similar symptoms, and require a patient diagnosis, is the cause of much of that empiricism, which prevails in the treatment of dyspepsia. Under any circumstances, it is often extremely difficult of management; but the difficulty is largely augmented by ignorance of those points.

At one time, it was—and still is, by many—conceived, that whenever there is a predominance of acidity in the stomach, it is owing to the elements of the food reacting upon each other;—to the food being detained so long in the organ, that its elements enter into new affinities; and, accordingly, that the acid is the direct product of the aliment employed; and, as saccharine substances generally produce the effect most markedly, the position has been considered to be confirmed. A slight examination of pathological facts will show the fallacy of this view. Every dyspeptic, liable to heartburn, must have observed, that when particular articles of diet have been taken, he has felt uneasiness almost

immediately after they have reached the stomach; and when it has been impossible for time to have been afforded for their transition through the vinous and acetous fermentations. This transition is not effected in an instant; yet, almost instantaneously, after a weak saccharine solution has been taken, the dyspeptic experiences cardialgia: and if he has recourse to his carbonated alkali, the presence of an acid is unequivocally demonstrated.

The fact of the generation of acid being favoured by particular articles of diet rather than by others has been noticed by every dyspeptic; and has been a puzzling circumstance to them as well as to the medical attendant. As acid is equally evinced, whether certain animal matters—as melted or empyreumatic butter—or saccharine substances be taken, it has been an interesting question to determine the precise character of the acid formed;—which, on the idea of its being produced from the reaction of the elements of the food on each other, ought to differ in these different cases. This perplexity is strikingly exhibited in a well told case of dyspepsia, complicated with other affections, by Dr. Paris. The following are the patient's own words—"I find that the perpetual recurrence of my old headaches leaves me nothing for it but to turn them into a subject of amusement. I have been reading some speculations about muriatic acid in the human stomach, and would like very much to know what acid is in mine; and I wish you would put me in the way of testing it, for I can obtain any quantity. If it is a vegetable acid, how does it get into giblet soup, or salt beef, or fresh butter, *cum multis aliis*? If it is an animal acid, I know of none except the phosphoric, and I have no idea of making a match-box out of my viscera, so I vote at once it is not that: if it is a vegetable acid, how comes it I may eat a dozen *ripe* peaches, and be none the worse for them; but wo to me if I eat a buttered muffin! *Ergo*, I infer that it is not wholly the acetic acid; and if not, what else can make *sweet* tea, or anything like ale, beer, or porter, perfect poison to me? As for an animal acid, there is no poison for me like strong broth, or soup; *ergo*, there must be some villany in that. I was told, the other day, that baked meat would disagree with me, and I find this to be the case. Now, for the muriatic acid, which I strongly suspect to be the one under which I suffer, for the action on my teeth, when I am sick, is too sharp for anything less pungent, I find that if I eat salt meat, an acid is immediately formed in my stomach, and yet I can take any quantity of salt with my meat, without being the worse for it: how can this happen?"

The true explanation of these morbid phenomena would appear to be, that there are certain articles of diet, which—when they come in contact with the lining membrane of the stomach of a dyspeptic—excite the organs, whose office it is to secrete the gastric acids, so that a larger amount of those acids is formed; and in this way acidity is produced, but not from the reaction of the elements of the food on each other. Under this view of the subject, the acids, met with in the stomach, ought to be the same, whatever may be the character of the food; and this is probably the case;—the chlorohydric acid always, perhaps, predominating, as it does in health; and giving rise to the strongly acid

effect occasionally produced on the teeth by eructations, which every dyspeptic must have experienced.

This is generally—if not universally the case—in dyspepsia; but there are articles of diet, which, under particular circumstances, may become so suddenly acid, that acidity may be induced by them, without the supposition of undue secretion of the proper gastric acids. Milk is one of them. This fluid, it is well known, becomes almost instantaneously acid when the air is highly charged with electricity; and there is reason to believe, that something similar may occur in the stomach of children particularly. The predominance of acidity is so great in infancy, that, as elsewhere remarked, most of the diseases of childhood have been ascribed to it: such predominance may be partly owing to the cause just assigned, and partly to augmented secretion of those acids, which, as has been shown, always exist in the stomach in a state of health. In children, the presence of unusual acid is easily detected:—the smell of the breath; the odour and taste of the regurgitations; the smell of the alvine evacuations, and their green colour, sufficiently indicate it. This greenness is owing to an admixture of acid with healthy bile, although it has been invoked to demonstrate the existence of disorder in the biliary system. If we take healthy bile and add nitric acid to it out of the body, a green colour is produced by the union. It is obvious, then, that, in this case, we should be egregiously in error, were we to give remedies which are conceived to modify the condition of the biliary organs, and that all our endeavours should be confined to the removal of the condition of the gastric apparatus, which occasions the acid predominance.

In adults, a certain degree of acidity is perhaps present, when not indicated by the ordinary symptom,—heartburn. It may be the cause of that irritability of the stomach, characterized by vomiting whenever food is received into the organ, as well as of the headache, and sleeplessness, which are relieved by full doses of carbonated alkalies. In those cases of gastric irritability, and in the sleeplessness in question—which consists of watching without any apparent bodily indisposition—half a drachm or two scruples of bicarbonate of soda act, at times, with surprising efficacy; the vomiting ceases in the one case; sleep follows in the other; and all the uneasy feelings, in both, speedily vanish.

From what has been said, it will be manifest, that antacids can be regarded merely as palliatives. When administered to neutralize acid in the stomach, they can act only on that which is in the organ: they cannot prevent the formation of more. To cure the cardialgia radically, the morbid condition, that gives occasion to the undue secretion of the acids, must be obviated. This, we have seen, is sometimes inflammatory, but, in the majority of cases, the excited condition of the organs, by which the gastric acids are secreted, is accompanied by a state of asthenia of other parts of the stomach. The muscular coat has its energy impaired; and, by restoring the balance by the appropriate administration of tonics and gentle excitants—singly or combined—accompanied by the adoption of an appropriate regimen, the symptoms are relieved, and, if the plan be properly persisted in, often entirely re-

moved; but no course of treatment, that does not combine an attention to diet and regimen can prove effectual.

As the pathological cause of cardialgia is commonly asthenic, it can be understood, why the union of antacids with tonics—as of magnesia or bicarbonate of soda with charcoal, or bitters—is so generally useful in that affection.

Amongst the different alkalies and alkaline earths, the therapist has ample choice to adapt his remedies to the various complications that may arise. If he desires a simple antacid, to be administered singly, or along with some vegetable bitter, he chooses *liquor potassæ*, *liquor calcis*, or bicarbonates or carbonates of potassa or soda: but if he wishes, at the same time, to produce some degree of excitation in the mucous coat of the stomach, and through it on the muscular coat, he selects ammonia or its carbonate. The carbonates are the milder preparations; but, occasionally, uneasiness is felt from the extrication of the carbonic acid gas, which is given off as soon as the alkali meets with the gastric acids; the gas, at times, instead of passing off through the upper orifice of the stomach, proceeding into the small intestines; and giving rise to colic, and to much intestinal disturbance. No such effect can be produced by the exhibition of the pure alkalies, which may be given in proper dilution. The same thing, of course, applies to the alkaline earths; and for this reason, pure magnesia, or that from which the carbonic acid has been driven off by heat, and lime water, which, when pure, contains no carbonic acid, are to be preferred. As regards these earths, too, the practitioner has a ground of preference, that cannot be lost sight of. The salts formed by the union of the gastric acids with magnesia are laxative; whilst those, formed by the union of lime with the same acids, are of a contrary character. If, therefore, the predominance of acidity be accompanied with constipation, or appear to demand the use of laxatives, the former earth is selected; whilst the latter may be indicated under opposite circumstances.

With respect to the diet and regimen, especially the former, that may be advisable in these cases, much will depend on the individual. Substances, which are easily managed by the digestive powers, and which individual experience has *shown* not to be 'dyspeptic,' must be taken; and as for other articles, that may not have been made the subject of experiment in the individual case, the author must refer to another work for details regarding their comparative digestibility. (*Human Health*, p. 179, Philada. 1844.) Of the proper regimen he has spoken, partly in that work, and partly under the head of 'REVELLENTS,' in the present volume.

Nothing is so markedly salutary, in these cases, as a thorough change of all the physical and moral circumstances surrounding the individual; and every dyspeptic must have noticed the freedom from his usual ailments, which he has experienced during the exercise of body and mind, which travelling affords. Of course, the more varied the scenery and the atmospheric conditions, the greater the revulsion produced by travelling; but in countries not possessed of all those advantages, mere travelling exercise, with due attention to diet, is perhaps the most beneficial agency that can be invoked by the dyspeptic. This is

a subject, however, which belongs more particularly to Special Therapeutics, and has, therefore, been canvassed elsewhere. (*Practice of Medicine*, 3d edit. vol. i. p. 85, Philad. 1848.)

Independently of the presence of acidity in the stomach, a condition of the system may exist, which may require the use of antacids; but this matter has been treated under the head of ANTILITHICS.

SPECIAL ANTACIDS.

1. SODÆ BICARBONAS.--BICARBONATE OF SODA.

Bicarbonate of soda is prepared by causing a stream of *Carbonic acid*, obtained from marble by the addition of dilute sulphuric acid, to pass into an appropriate box containing *Carbonate of soda*, until this is fully saturated. It is a white opaque salt,—the crystals, when perfect, being oblique rectangular prisms. As generally met with, however, it is a white crystalline mass, or a whitish powder. Its taste is slightly alkaline. It is wholly soluble in water.

It has the same properties as bicarbonate of potassa, but it is more prescribed as an antacid. It is certainly much less disagreeable than either carbonate of potassa or carbonate of soda, and the stomach is likely to suffer less from its protracted use than from that of either of those salts. "It is often resorted to," says Dr. F. Bache, "in calculous cases, characterized by predominant uric acid; and from its higher neutralizing power, on account of the smaller equivalent of soda, it may be considered preferable as an antacid to the corresponding salt of potassa."

Its dose, as an antacid, is from gr. x to ʒj. It may be taken in water, or in the mineral water of the shops, in which case it resembles LIQUOR SODÆ EFFERVESCENS of the London Pharmacopœia.

2. SODÆ CARBONAS.—CARBONATE OF SODA.

Carbonate of soda is manufactured on a large scale, and, therefore, has been classed amongst the articles of the *Materia Medica* in the Pharmacopœia of the United States. It may be procured from *Barilla*, an impure carbonate of soda obtained by burning plants of the order *Chenopodiaceæ*; from *Kelp*, obtained by burning plants of the order *Algaceæ*; and from the decomposition of sulphate of soda.

Freshly prepared carbonate of soda is in colourless crystals, which slightly effloresce in dry air, and dissolve in twice their weight of water at 60°, and in less than their own weight at 212°. The crystals are generally large, and are oblique rhombic prisms. They have a cooling, alkaline, disagreeable taste.

It possesses medical virtues identical with those of the carbonates of potassa, and the salt last mentioned; but it is not so often employed

as the bicarbonate, which is less disagreeable, whilst it is equally efficacious as an antacid. The dose may be from gr. x to ʒss.

SODÆ CARBONAS EXSICCATUS, DRIED CARBONATE OF SODA. (Prepared by exposing *Carbonate of soda* to heat in a clean iron vessel, until it is thoroughly dried; and rubbing it into powder.) The only advantage in this preparation is, that it admits of being made into pills, when it is advisable to combine it with tonics. It is about twice the strength of the carbonate.

3. POTASSÆ BICARBONAS.—BICARBONATE OF POTASSA.

Bicarbonate of potassa, *Sal aëratum*, often improperly called *Sal æratum*—is made by dissolving *Carbonate of potassa* in *Distilled water*, and passing *Carbonic acid* through the solution until it is fully saturated. The liquor is then filtered, and evaporated by a gentle heat, until crystals form. The carbonic acid is obtained from marble by the action of dilute sulphuric acid.

Bicarbonate of potassa is in white crystals, which are wholly soluble in water. It has a slightly alkaline taste, is soluble in four times its weight of water at 60°, but insoluble in alcohol. It undergoes no change on exposure to air.

This salt may be used as an antacid in the dose of gr. x to ʒj; but it is by no means as often prescribed as bicarbonate of soda.

4. POTASSÆ CARBONAS.—CARBONATE OF POTASSA.

Impure carbonate of potassa—**POTASSÆ CARBONAS IMPURUS**—is known in commerce under the name *Pearlash*. It is principally obtained from the lixiviation of wood ashes. To prepare the carbonate of potassa, pearlash is dissolved in water, and filtered; and the solution is evaporated in an iron vessel, until the salt granulates. It is generally kept in this granular state, owing to the difficulty of crystallizing it. It is often called *Subcarbonate of potassa* and *Salt of tartar*; although the latter term is more appropriate to **POTASSÆ CARBONAS PURUS**. It has a strongly alkaline urinous taste; is very soluble in water, but insoluble in alcohol; and attracts water freely from the air, so as to become liquid, and form *Oleum tartari per deliquium*.

The dose, as an antacid, is from gr. x to ʒss, in sweetened water. It is, however, more disagreeable than the bicarbonate; and, owing to its more active alkaline character, it is apt to do more injury to the lining membrane of the stomach when used very frequently. It is, therefore, not so often employed as an antacid as the bicarbonates of soda and potassa.

PURE CARBONATE OF POTASSA—POTASSÆ CARBONAS PURUS—*Salt of tartar*, more properly so called—is directed in the Pharmacopœia of the United States to be made by rubbing *Bitartrate of potassa* and *Nitrate of potassa* separately into powder; then mixing and throwing them into a brass vessel heated nearly to redness, that they may experience com-

bustion. From the residue, the pure carbonate is formed in the same manner as the carbonate.

In regard to its medical virtues, they are precisely the same as those of the carbonate. Pure carbonate of potassa enters into the preparation of LIQUOR POTASSÆ ARSENITIS.

LIQUOR POTASSÆ CARBONATIS, SOLUTION OF CARBONATE OF POTASSA. (*Potass. carbonat.* ℥j; *Aquæ destillat.* f.℥xij.) This is a simple solution of an ounce of carbonate of potassa in a fluidounce of distilled water; and is hardly worthy of its place as an officinal preparation. The dose is ℥x to f.℥j, in water or milk.

5. LIQUOR POTASSÆ.—SOLUTION OF POTASSA.

Solution of potassa or *Soap lye*—*Lixivium saponarium*—is prepared by dissolving *carbonate of potassa* in *distilled water*; slaking *lime* with another portion of water; mixing the hot liquors; boiling for a short time; setting aside, and pouring off the supernatant clear liquor, which must be kept in well-stopped bottles of green glass. If not preserved from the contact of air, it becomes converted into a solution of carbonate of potassa, owing to the absorption of carbonic acid: the direction to keep it in green glass bottles is required because of its acting slightly on white flint glass.

The specific gravity of liquor potassæ of the Pharmacopœia of the United States is 1.056. It is limpid, colourless and devoid of smell; but has an acrid taste. When rubbed between the fingers, it has a soapy feel, owing to its partly dissolving the epidermis.

Solution of potassa is used, at times, as an antacid; but owing to its causticity it is not so often prescribed as the carbonates of soda and potassa, which are equally effective as neutralizers of acid. The dose is from ten to thirty drops, given in infusion of orangepeel, veal broth, or in table beer that is not acid. Like all the alkalies, it is often associated with the vegetable tonics, under the compound view referred to in the general consideration of antacids. (Vol. ii. p. 354.)

6. LIQUOR AMMONIÆ.—SOLUTION OF AMMONIA.

This preparation, whose general properties are described elsewhere, (Vol. i. p. 500,) may be given as an antacid, whenever it is desirable not only to neutralize redundant acid, but likewise to stimulate the stomach to greater energy. Its dose may be from gtt. v to gtt. xx, in a wine-glassful of water.

7. AMMONIÆ CARBONAS.—CARBONATE OF AMMONIA.

Carbonate of ammonia (Vol. i. p. 502,) is possessed of the same properties as the last preparation. It may be given, in the dose of from five to ten grains, in the form of pill, or in solution. A good vehicle for the pilular form, in cases of atonic dyspepsia, is extract of gentian.

8. MAGNE'SIA.

Magnesia, Calcined magnesia, (Vol. i. p. 164,) is an excellent antacid;—the salt, resulting from the union of the gastric acids with it, being laxative. It is, hence, well adapted for cases in which too great a secretion of gastric acids exists along with constipation, or a tendency thereto. It is devoid of irritating properties, and is calculated for most cases in which there is a predominancy of acid. It may be given in the dose of from gr. x to gr. xxx. When very frequently used, it is said to have accumulated in the bowels, so as to give rise to ileus; but these cases must be exceedingly rare. The best vehicle for its administration is milk.

TROCHIS'CI MAGNE'SIÆ, TROCHES OF MAGNE'SIA. (*Magnesiæ* ʒiv; *Sacchar. fʒj*; *Myristic. pulv.* ʒj; *Mucilag. Tragacanth. q. s.*; to be made into troches, each weighing ten grains.) These lozenges are beneficial in acidity of the stomach accompanied by constipation. The same properties belong to

9. MAGNE'SIÆ CARBONAS.—CARBONATE OF MAGNE'SIA.

the dose of which is likewise the same.

10. CRETA.—CHALK.

CRETA PRÆPARATA, PREPARED CHALK, (Vol. ii. p. 147,) is an excellent antacid, especially—as before remarked—where it is desirable that the resulting compound, from the union of the acid with the antacid, should be possessed of an astringent action. The dose, as an antacid, may be from ten to forty grains or more, three or four times a day, in sugared water, or in any vehicle.

TROCHIS'CI CRETÆ, TROCHES OF CHALK. (*Cretæ præparat.* ʒiv; *Acaciæ pulv.* ʒj; *Myristic. pulv.* ʒj; *Sacchar. pulv.* ʒvj. To be made into troches each weighing ten grains.) These lozenges may be used wherever chalk is indicated as an antacid.

11. LIQUOR CALCIS.—LIME WATER.

Lime-water (Vol. ii. p. 148,) is often an efficient antacid, in the same cases as chalk; the compound, formed with it and with chalk by the gastric acids being identical. It may be taken either alone, or mixed with milk; and, in this form, is serviceable, especially where acidity exists along with diarrhœa or a tendency thereto. Its dose is from f.ʒij to f.ʒiv, or more, several times a day.

II. ANTALKALIES.

Definition of antalkalies—Cannot often be needed—Alkaline state of the Habit—Mode of improving defective nutrition—Special antalkalies.

THIS class of medicines is unimportant, inasmuch as circumstances but rarely arise that can be conceived to indicate their use. "Free alkalies," it has been asserted by Dr. A. T. Thomson, "are rarely present in the stomach." It may be questioned, whether they be ever met with in that organ, in health. It is not, indeed, easy to conceive of their presence there, unless we consider, that the gastric solvent varies materially in character, so that at one time it shall be the very antithesis to what it is at another. In the case of fistulous opening into the stomach, to which the author has more than once referred, opportunity was afforded for examining the gastric secretions under various circumstances of sickness and health. In every case, the acid character was marked. The chlorohydric and acetic or lactic acids were always contained in it in considerable quantity.

The idea that free alkalies may exist in the stomach doubtless rests mainly on the affirmations of Dumas and others, who have asserted, that the 'gastric juice' was acid or alkaline, according as the dog—the animal experimented on—was fed on animal or on vegetable diet. But these experiments were made on dogs; and on the mixed secretions from the lining membrane of the supra-diaphragmatic portion of the alimentary tube, from the salivary glands, and the stomach itself; and, besides, they do not seem to have been performed with care or accuracy, as the best testimony certainly is in favour of the gastric secretions—in the case of man—being always acid. Should, however, the acid secretion be arrested from any cause, neutral indigestion may supervene, which may require the use of acids for its removal. In the absence of all secretion of acids, we can understand, that there may be an alkaline condition of the secretions in the stomach, derived from the saliva.

It has been long maintained, that an alkaline state of the whole habit may exist, and this is considered to be indicated by "the chemical quality of the urine, accompanied with paleness of the countenance, lassitude, irregular bowels,—sometimes costive, sometimes too relaxed,—and a tendency to hysteria in females." Mental as well as corporeal causes, diseases affecting the spinal cord, whether in the loins, back, or neck, and whether paralysis be present or not, it is said, produce an alkaline state of habit, which is displayed in the urine. But the inferences, deducible from the condition of that fluid, are not as clear as they might appear to be. Its character varies from numerous causes, and, even in health, we notice the greatest difference. At times, it may be acid,—at others, alkaline. Except as regards its colour, transparency, and deposits, we cannot say much; and, indeed, great obscurity rest on the causes of these qualities. On this account it is, that uroscopy is not as much attended to at the present day as it was formerly, or as it ought to be. Of late, its microscopic

characters in health and disease have been more studied, but we have yet much to learn in regard to it. The condition of the urine differs materially according to the varying condition of the functions of nutrition, and a state of the system may be present, which might, perhaps, be esteemed of an alkaline character, and is capable of being best rectified by the administration of acids.

Professor Chaussier, of Paris, in a letter to M. Broussais, has affirmed, that in all states of disease or of prolonged irritation the secretions become alkaline. He observes: "From a great number of researches and experiments, which I formerly made, it has appeared to me: *First*. That in general, in a state of health, all the soft parts and the greater proportion of the fluids of the animal body are more or less acid; or, if it be preferred, have a tendency to redden test papers: *Secondly*. That others appear to be neither acid nor alkaline: *Thirdly* and finally: that some (as the semen) are alkaline. But, in a state of disease or prolonged irritation, all contract an alkaline quality, which renders them capable of changing the test papers to a green colour; thus, the perspiratory humour, which in a state of health is always acid, sometimes assumes an alkaline character. The urine which in health immediately reddens litmus paper, becomes evidently alkaline, if the kidneys or bladder are in a state of irritation or inflammation: in some cases it even contracts a strong ammoniacal odour, which is perceptible at some distance. It is the same with all the excretions, which are augmented by any grade of irritation. Thus, in some cases of coryza, the humour, which flows from the nostrils, is so acrid as to occasion the swelling of the upper lip, which is generally regarded as a sign of a scrofulous constitution. It is the same as regards the excretions from the bronchia or lungs, which always, when the irritation or the disease becomes violent, assume an alkaline character, and give a green colour to test papers. The humour, which flows from ulcerated cancer or other analogous affections, is also more or less alkaline: it has even appeared to me, that in a healthy subject, having a suppurating wound, the pus of which is laudable, this pus will not, or at least will only feebly, redden test papers, but if the suppurating surface be wiped several times, or if it be irritated in any other way, it soon furnishes a clear serosity, which then changes the papers to a green colour."

It was from views, similar to those of Chaussier, that many of the older pathologists considered those cases of inveterate cachexia, which exhibit so strongly a firmly implanted *vice* in the nutritive functions of every part of the frame, to be evidences of a predominant alkalescency, that could only be removed by the administration of acids. These views have almost passed away; but we ought not to lose sight of the pathological fact, that such a *vice* may be accompanied by an alkaline condition of the urine, in the same manner as one form of the calculous diathesis—also dependent upon faulty nutrition—is indicated by deposits of the phosphates from the urine. It is, however, to the removal of the derangement of the function of nutrition, that our attention as pathologists and therapeutists has to be directed.

SPECIAL ANTALKALIES.

The remedies adapted for the removal of alkalescency are ACIDS—MINERAL and VEGETABLE—associated with various tonic and revulsive agencies, described under the head of ANTILITHICS. (See Vol. i. p. 298.)

 III. DISINFECTANTS.

SYNON. *Antipestifera, Antiputrescents.*

Definition of disinfectants—Antiseptics—Modus operandi of disinfectants—Bad effects of odorous fumigations—Of heat, mineral acid vapours and the chlorides as disinfectants—Use of antiseptics—Special disinfectants.

THE term *disinfectants* has been restricted by Dr. A. T. Thomson to those agents, that are capable of neutralizing morbid effluvia; but as he has used it synonymously with antiseptics, the definition is manifestly not sufficiently comprehensive. Under this head will, therefore, be considered, in addition, substances that may be esteemed ANTISEPTICS—or agents that are capable of removing any incipient or fully formed septic condition of the living body, or of any part of it.

To inquire fully into the subject of disinfection, it might be advisable to investigate every form of atmospheric vitiation, whether it consist in the presence of some known noxious gas; of those terrestrial emanations that give rise to intermittent fever; or of the effluvia that appear to proceed from one labouring under a disease presumed to be communicable, and are capable of producing the same disease in one exposed to their influence. The author has entered pretty fully, however, in another work, into the history of physical agents that influence human health; and he will, consequently, confine himself chiefly, in this place, to some observations on the mode of disinfecting or purifying any confined space from morbid miasmata—terrestrial or animal. (*Human Health*, p. 61, Philad., 1844.)

It is manifest, that every such disinfecting agent must be capable of chemically combining with the effluvia, and depriving them of their morbid properties. In no other way can we conceive that disinfectants can act. Although we are entirely unaware of the precise character of the *tertium quid*—if it may be so called—which emanates from a body labouring under a contagious disease, and produces a like affection in another body exposed to it, we have the best possible evidence, that such an emanation or miasm is disengaged; and should this come in contact with a fit recipient, disease will result. The emanation must, therefore, have its very nature destroyed by disinfectants, and the product of the decomposition be rendered altogether harmless.

This is not the place to enter into a discussion as to what diseases are unquestionably contagious. Much that is erroneous has doubtless been conceived and written on the subject. It is sufficient to know, that a

locality is considered, from any cause, to require disinfection, to render it important to inquire into the means for accomplishing this object.

There are no agents, which can be employed with well founded expectations of success as disinfectants. Many that are used are positively injurious, exerting no destructive effect on the noxious emanations, whilst they interfere with the purity of the air, and thus favour their pestiferous agency. Of these, burnt sugar may be regarded as one. It is often employed with the view of removing other odours ; but it can obviously act merely by its odour overpowering them ; whilst the amount of adventitious matter in the air of the apartment is augmented by it, where proper ventilation is not adopted ; and, where it is, the ventilation is more effective, when these presumed disinfectants are not employed. Even where true disinfectants are used, it is highly necessary, that the air of the sick chamber should be changed by thorough ventilation. Every such agent adds a material to the air of the apartment, that ought not to be suffered to remain, and is, consequently, so far deteriorating ; whilst many of them are so penetrating as to induce much irritation in the respiratory organs, and, under certain circumstances, their employment may be followed with marked disadvantage. Even were they able to disinfect the air, they might occasion mischief from their own irritating qualities.

What has been said, regarding the effect of burnt sugar, applies equally to many other substances, that were, and still are, much used as disinfectants,—such as benzoin, camphor, and different aromatic substances. They are not more efficacious, and are equally liable to the disadvantages attendant upon its employment. Heat has long been esteemed a powerful disinfectant ; but its reputation has chiefly reposed upon certain notions connected with its power of changing the condition of the atmosphere during epidemics. Hence, in times of spreading sickness, it has been advised to light large fires with the view of destroying effluvia supposed to exist in the air. The coincidence that occurred between the last visitation of the plague in London, in 1665, and the great fire in 1666, has been esteemed, by some, to favour this view ; but the presumed cause is insufficient to account for the effect. Although the heat might have destroyed the morbid miasms—which in the case in question is doubtful—it could not have prevented the recurrence of the evil. Its subsequent non-appearance seems to have been owing to other causes ;—a better system of ventilation and draining was adopted ; the streets were widened ; common sewers were established ; and paving was every where introduced ;—circumstances that are adequate—even without sanitary regulations, which were rigidly enforced, but whose agency was more than doubtful—to account for the change.

But, although heat can scarcely be used with advantage for purifying districts suffering under epidemic or contagious maladies, it may perhaps be capable of disinfecting confined spaces, and bodies imbued with morbid miasms. In experiments by Dr. Henry, of Manchester, England, he found, that substances, impregnated with the matter of contagion, and exposed to temperatures of from 200° to 204° , for a considerable length of time, were rendered incapable of communicating

disease, even when they consisted of clothes that had been worn during the whole period of a contagious malady. He inclosed the substances to be disinfected in air-tight canisters, and exposed them to dry heat for a certain time; and he esteems this process to be superior to exposing them to gases, inasmuch as gases may be arrested in their course by compressed materials, whilst no arrangement can prevent the transmission of caloric. The agent he employs is steam, passed between the sides of a tin copper box, and an outer case of the same material. The most delicate goods cannot be injured by the application of the degree of heat disengaged by this means.

At one time, mineral acid vapours—muriatic, nitric, and ‘oxymuriatic’—as it was then termed—were almost solely employed as disinfectants. For the discovery of the powers of nitric acid vapours, Dr. Carmichael Smythe received the disproportionate reward of ten thousand pounds, according to some, (A. T. Thomson,)—five thousand, according to others, (Pereira,)—from the British Parliament;—yet chlorine, in some form, has so completely taken its place, that we rarely hear, at the present day, of its employment. Acid gases are liable to the objection, that they are extremely irritating when respired: indeed, in a state of concentration they are irrespirable. They cannot, therefore, be used in the sleeping apartments of the sick, but may be beneficially employed, after patients have been withdrawn, and the object is to disinfect the chamber. They ruin polished metallic surfaces; but this can be obviated by painting them with a compost of starch.

The inconveniences, attendant upon the use of acid gases, and of chlorine disengaged in the ordinary way, are obviated by using the chlorinated preparations—of lime and soda especially—for the discovering of the disinfecting properties of which we are indebted to M. Labarraque, an ingenious French *pharmacien*, who, in the year 1824, fully established their title to the reputation of being our best disinfecting materials. In these preparations, the chlorine is retained by such a feeble affinity, that even the carbonic acid of the air is sufficient to displace it. Chlorine is, in this way, gradually given off, and the base unites with the carbonic acid to form a carbonate. All that is necessary to be done, is—to expose the chlorinated lime, or the solution of chlorinated soda, in flat shallow vessels, in the sick room, as occasion may require. Indeed, aspersions with a solution, not containing more than one two-hundredth part of chlorinated lime, have been esteemed adequate to the disinfection of the wards of a large hospital.

Where bodies, which have remained for some time in the earth, have to be exhumed, the strength of the solution must be increased, and it may be well to dip a cloth in the liquid, and envelop the body in it; moistening the cloth occasionally with the solution. There is no object requiring disinfection for which the chlorinated preparations are not appropriate. Where excrementitious matters have to be retained in the bed chamber, the offensive odour is neutralized by throwing one of them into the vessel and around the chamber; and the great advantage of this mode of disinfection is, that it may be used in the chambers of the sick without the disengaged chlorine exciting any inconvenience.

The chief disinfecting agents employed at the present day are—

chlorinated soda, chlorinated potassa, and chlorinated lime; nitrate of lead, and chloride of zinc. Almost all disinfecting solutions are composed of one or other of these salts. All are valuable antibromics: the question is, whether any of them is a destroyer of the material agent that causes spreading disease. They have all been largely extolled as preventives of epidemic and contagious diseases; but the evidences in favour of such prevention ought to be closely sifted, inasmuch as it is easy for an article to attain celebrity as a preventive of a disease, which may attack one in a hundred of a community, provided only thirty or forty take the article, and escape. Hence, the reputation of tincture of camphor, and of various empirical cholera preventives, of the present and former periods.

It is well, therefore, to bear in mind the probability, that chemical and other agents may merely act as antibromics, deodorizers or destroyers of smells; and that the miasm, that occasions disease, may not be destroyed by them or be rendered innocuous.

Thus much as regards the disinfection of the air of confined situations, or of substances that have imbibed contagious effluvia. It remains to touch briefly on such as are esteemed capable of removing any incipient, or fully formed septic condition in the living body, or in any part of it.

Connected with this subject, it is important to bear in mind the results of experiments, instituted by Dr. Stark, which show, that when pieces of cloth, of different colours, are exposed to odorous particles emanating from bodies, some absorb a larger amount than others. His experiments exhibit, that black and dark blue absorb twice as much as white; and he infers, with probability, that contagious emanations may be subject to similar laws with odorous emanations; and that, accordingly, in times of contagious maladies, black is the worst colour that could be worn. "Next, therefore," he says, "to keeping the walls of hospitals, prisons, or apartments occupied by a number of individuals, of a white colour, I should suggest that the bedsteads, tables, seats, &c., should be painted white, and that the dresses of the nurses and hospital attendants should be of a light colour. A regulation of this kind would possess the double advantage of enabling cleanliness to be enforced, at the same time that it presented the least absorbent surface to the emanations of disease."

The humorists of old believed, that the animal body can undergo putrefaction or a septic change, even whilst the vital force is still pervading it; and many of their pathological notions were based upon the belief of such a conversion having taken place in the humours; but, in the sudden change from humorism to solidism, these notions were exploded; and it was considered the height of absurdity to believe such a change possible. The force of life was conceived to counteract every septic tendency. Within certain limits, these views are accurate. We can scarcely imagine a condition of the living body in which all its parts shall be putrid. Putrefaction cannot be fully formed unless the principle of life is extinct; but that a putrescent state may be present in the living body is evidenced by numerous facts. The

condition of the organism in those fevers that have been called *putrid*, in the worst cases of scurvy, and where individuals have been exposed for a sufficient length of time to a putrid atmosphere, sufficiently exhibits, that a septic change may be effected, between which and putrefaction the same relation may be conceived to exist as between gangrene and sphacelus:—in the former the part may be considered in a state of suspended animation, admitting of resuscitation; whilst, in the latter, the principle of life is extinct, and the mischief irretrievable. The analogy holds good, too, in a therapeutical point of view. The remedies that are appropriate in a case of gangrene are equally indicated in putrescency of the system; whilst in fully developed putrefaction—as in sphacelus or true mortification or death of a part—no therapeutical agent can be possessed of any efficacy. Of the various signs of death—many of which are so equivocal—putrefaction is the most satisfactory; and when the ordinary signs have been wanting, it has been advised to keep the body above ground, until there could be no doubt, from the evidence of the senses, that its elements were beginning to yield to the play of new affinities.

Granting, that such a septic tendency may exist in the organism under particular circumstances, we can conceive, that antiseptics may be needed in two contingencies:—*first*, to obviate such septic tendency; and *secondly*, to correct the offensive character of the tissues or secretions that may have become putrid, and thus prevent them from reacting on the system. For fulfilling the first object, the most opposite plans of management may be requisite in different cases. If we inquire into the causes of the positive death of parts, to which the name *mortification* has been given, we find them to be numerous: they may consist in excessive action of vessels; in great irregularity of circulation, and innervation; in the use of certain agents as food,—ergot of rye, for example, &c. &c.; and, accordingly, as the causes are various, the means to be adopted for their removal must be equally so. Hence, antiphlogistics may, in one case, be antiseptics; whilst in another, tonics and stimulants may prove so.

It is not, however, to the agents just mentioned that we ordinarily apply the term antiseptics. Its acceptance is usually confined to agents that are employed when signs of putrescency or of decomposition have already manifested themselves; and when the object is both to destroy the offensive character of the tissues or secretions, and to arouse the vital energies, so as to enable the function of nutrition to take fresh activity, and throw off the morbid and morbid degeneration. For this purpose, different vegetable tonics, and especially cinchona, with mineral acids are generally exhibited, with the view of inducing a new action in the function of innervation, and, through improved hæmatisis, of enriching the vital fluid, so that, when it reaches the capillaries,—under the amelioration, occasioned by these combined changes,—the organs of nutrition may assume fresh activity, and if a portion of the organism has become dead, and consequently extraneous, a separation of the dead from the living portions may be more readily accomplished. It is in this way, probably, that most internal antiseptics act; whilst by passing into the mass of blood, and being exhaled through the dif-

ferent emunctories, they may, at the same time, correct any septic condition or tendency, which the different tissues or fluids may have acquired.

There are some antiseptics, however, whose action cannot be explained in this manner. It can obviously be only the *modus operandi* of such as enter the blood-vessels—wholly or in part. Charcoal probably exerts its efficacy altogether on the first passages, and through them on the rest of the frame. It is difficult to conceive, that it can act in any manner through the medium of the circulation; whilst chlorides, mineral acids, creasote, &c., produce their effect in the compound mode above described.

In like manner, when these and other agents are applied externally to gangrenous or gangrenoid parts, their operation is equally complex. They first of all act chemically on the organic matters with which they come in contact; and, as a general rule, stimulate the vital energies of the tissues, until these assume a new action, and throw off the morbid condition and degenerations. It is with this view, that antiseptics are employed in gangrene, sphacelus, foul ulcers, &c. &c. Some of them would seem to act merely as antibromic disinfectants. Such is, probably, the case with charcoal. When applied to a gangrenous or sphacelated part, it scarcely, perhaps, retards the progress of putrefaction. It merely destroys the putrid emanations, and thus prevents them from reacting injuriously on the system.

SPECIAL DISINFECTANTS.

In considering the different disinfectants, it may be convenient to divide them into two classes:—the *first*, including those that are employed to disinfect apartments, clothing, &c.; and the *second*, disinfectants of the living body or antiseptics.

a. *Disinfectants of apartments, clothing, &c.*

1. CHLORINUM.—CHLORINE.

Fumigations of chlorine have long been used for the purpose of destroying the matter of contagion, and of preventing the spread of contagious diseases. Towards the close of the last century, they were proposed by M. Guyton de Morveau; and hence have been called *Guytonian* or *Guyton-Morveau fumigations*.

The following method was employed by Dr. Farady for disinfecting the General Penitentiary at Milbank, Westminster. One part of *common salt* was intimately mixed with one part of the *black oxide of manganese*; the mixture was placed in a shallow earthen pan; and two parts of *oil of vitriol*, previously diluted with two parts by measure of water,

were poured upon the mixture,—the whole being stirred with a stick. Chlorine continued to be liberated for four days. The quantities of ingredients employed were 700 pounds of common salt; the same amount of oxide of manganese, and 1400 pounds of sulphuric acid.

Chlorine is supposed to act by abstracting hydrogen from miasmata; but we are not yet sufficiently instructed in the nature of the miasmata themselves to enable us to pronounce positively on this matter. Were they proved to consist of sulphuretted hydrogen, we could readily comprehend the agency of the chlorine, which speedily decomposes that gas; but we are yet altogether in the dark in regard to the nature of malaria of all kinds; although ready to admit, that an unusual quantity of sulphuretted hydrogen may occasionally be found in the air of malarious regions, as we know it is in places which are certainly not malarious.

As disengaged in the mode described above, chlorine is extremely irritating when breathed, and cannot, therefore, be used in the sleeping apartments of the sick, although it may be employed after they have been withdrawn, and the object is to disinfect the chamber. It certainly has great power as an antibromic; but, as remarked of chlorinated lime, it has yet to be proved whether it be capable of preventing the extension of spreading diseases. Not many years ago, Professor Daniell, of King's College, London, inferred, that the essence of the febrific miasms of the river Niger, in Africa, was sulphuretted hydrogen; and, as this is decomposed by chlorine, he also inferred, that it was but necessary for a ship navigating the pestilential waters of that river to be provided with an apparatus, that could disengage a sufficient quantity of chlorine, to continue there with impunity. Ships were accordingly furnished by the British government with an expensive apparatus for the evolution of the reputed disinfectant; but the fallacy of fact and inference was fatally demonstrated by the results of the subsequent expedition, which suffered more disastrously from the endemic of the country than any previous one. Chlorine was found to possess no disinfecting power over febrific malaria. At the Small Pox Hospital, London, chlorine was employed with the view of arresting the progress of erysipelas in the wards, and therefore in a restricted space, which ought to have favoured its action. The offensive smell was as usual removed, but the propagation of the disease appeared to be unaffected; and during the progress of cholera in Europe in 1831 and 1832, extensive trials were made with it, which led to the conclusion, on the part, not only of the medical practitioners, but of all who had an opportunity of witnessing them, "that there does not exist between chlorine and the agent that causes cholera any combination calculated to neutralize the influence of that deleterious agent." At the time when the cholera hospital at Moscow was filled with clouds of chlorine, the greatest number of attendants was attacked; and similar facts were noted by distinguished observers in Berlin and elsewhere.

AQUA CHLORINI, (Vol. i. p. 257,) is occasionally sprinkled in the sick chamber to purify the atmosphere during the prevalence of contagious or other diseases.

2. CALX CHLORINATA.—CHLORINATED LIME.

Chlorinated lime, chloride of lime—whose main properties have been described under EUTROPHICS, (Vol. ii. p. 326,) has been much used for purifying the air of the wards of hospitals, jails and ships,—a little of a solution (*Calcis chlorinat.* ℥j—℥iv; *Aquæ* Oj;) being sprinkled, from time to time, on the floor; or shallow vessels, containing the chloride, being placed in different parts of the room.

It is used, also, for disinfecting clothing, furniture, &c., care being taken that due ventilation is practised. In anatomical investigations, this agency has been most useful, especially where a body has been exhumed after having been a long time buried. Some time before dissection, the body may be enveloped in a cloth wetted with the solution mentioned above, which must be kept wet by sprinkling it from time to time. It is doubted, and even denied, that its use is productive of any advantage in preventing the spread of infectious, contagious or epidemic diseases. It has, indeed, been affirmed to be positively injurious, by deteriorating the atmosphere; and in this there may be truth, unless the precautions before mentioned, for due ventilation, be taken. In various cases, in which such diseases have prevailed, it has destroyed all offensive odour, but the extension of the malady has not been prevented.

Chlorinated lime has, likewise, been used as an antibromic in privies, and to destroy the unpleasant smell from sewers, drains, and from those occupations in which putrid animal substances are employed.

3. LIQUOR SODÆ CHLORINATÆ.—SOLUTION OF CHLORINATED SODA.

Chloride of Soda, Labarraque's Soda Disinfecting Liquid—whose general properties have been described elsewhere, (Vol. ii. p. 327,) has been used as a disinfectant in the same cases as chlorinated lime. It may be diluted with water, in the proportion of one fluidounce of the solution to a pint.

4. ACIDUM MURIATICUM.—MURIATIC ACID.

Gaseous muriatic, chlorohydric or hydrochloric acid is procured, for the purpose of disinfecting, by mixing twelve parts of *muriatic acid* with fifteen parts of *chloride of sodium* moistened before the acid is added. In this process, the water is decomposed,—its oxygen going to the sodium and forming soda, and the hydrogen uniting with the chlorine, and escaping as muriatic acid gas. The sulphuric acid unites with the soda formed, and remains as sulphate of soda.

Muriatic acid gas has a pungent odour, an acid taste, and is very irritating to the respiratory passages when inhaled. It is a colourless, invisible gas; but fumes in the air, owing to its affinity for aqueous vapour.

This gas has been much employed as a disinfectant, but its beneficial agency has been doubted; and it is certainly less used than chlorine.

When it is desired to disinfect an apartment, portions of the mixture mentioned above may be placed in shallow vessels about the room.

5. ACIDUM NITRICUM.—NITRIC ACID.

The vapour of nitric acid, may be employed as a disinfecting agent ; but although—as before remarked—(Vol. ii. p. 364,) the first proposer of it, Dr. Carmichael Smythe, received an exorbitant reward, it has now almost wholly given way to chlorine, to which it is supposed, by most persons, to be inferior. A recent writer, however, Dr. Christison, thinks it probably the best of the disinfecting gases or vapours ; “for,” he remarks, “it may be disengaged throughout the air of an apartment without the previous removal of the sick ; and as the acid destroys all animal textures and principles with which it comes in contact, its vapour can scarcely fail to destroy equally all invisible animal effluvia.” It may be set free by mixing equal parts of *nitrate of potassa* and *sulphuric acid*—placing the mixture in shallow vessels about the room. Half an ounce of nitrate of potassa, and the same quantity of sulphuric acid, are said to be sufficient to disinfect a cubic space of ten feet.

6. ACIDUM SULPHUROSUM.—SULPHUROUS ACID.

Sulphurous acid is sometimes used as a disinfectant of chambers and clothes. It is prepared by simply setting fire to sulphur, and introducing the vessel containing it into the room to be purified. It is employed to fumigate clothes that have been used by one affected with itch, and is very effective.

7. ZINCI CHLORIDUM.—CHLORIDE OF ZINC.

This salt, the general properties of which have been described elsewhere, (Vol ii. p. 66,) is possessed of powerful antiseptic virtues. It is the basis of the “*Disinfecting fluid of Sir William Burnett*,—a patent preparation for preserving timber, canvas, &c., from dry-rot, mildew, &c. The solution consists of twenty-five grains of zinc to the fluidrachm ; and in using it, one pint is mixed with five gallons of water. It has been largely employed in the anatomical rooms of this country and Europe, but it does not give off any antiseptic vapour : consequently, its action is restricted to the substances with which it is brought into immediate contact. Its disinfectant and antibromic virtues appear to be dependent on its power of decomposing hydrosulphate of ammonia.

8. PLUMBI NITRAS.—NITRATE OF LEAD.

Nitrate of lead—officinal in the Edinburgh Pharmacopœia—is formed by dissolving litharge in dilute nitric acid ; filtering, and setting aside to crystallize. It dissolves in water ; and the solution is sweet and austere. It is the basis of ‘*Ledoyen’s disinfecting fluid*,’ which attained so much reputation, a few years ago, that the British government directed experiments to be instituted with it for disinfecting the subjects of

spreading disease, as well as infected localities. It is a solution of one drachm of nitrate of lead in a fluidounce of water; and it certainly destroys, most effectually, the unpleasant odour of animal and vegetable substances that are evolving sulphuretted hydrogen and hydrosulphate of ammonia; but there is no evidence to show, that it has any power of destroying the emanations that give occasion to disease. In the year 1847, along with Col. Calvert, Mr. Ledoyen visited Canada, for the purpose of testing, under the sanction of the British government, the disinfecting virtues of his fluid on the subjects of typhus or 'ship fever,' and on the localities in which it prevailed. Col. Calvert, in full belief of its disinfecting power, fell a victim to the disease; and it was generally, if not universally, admitted there, that, as a destroyer of febrile miasmata, it was useless; although possessed of efficacious properties as a destroyer of offensive odours.

9. CALORIC.

Enough has been said on the method of employing heat as a disinfecting agent in the general remarks at the head of this section, (Vol. ii. p. 363).

b. *Disinfectants of the Living Body.—Antiseptics.*

10. ALUMINÆ SULPHAS.—SULPHATE OF ALUMINA.

Of late years, M. Gannal has discovered, that the aluminous salts are eminently possessed of the property of preserving animal matters; "their bases combining with geline to form a special compound, the acid being set free." He found the aluminous deliquescent salts to be of all saline substances those that afforded the most satisfactory results. *Acetate of alumina* and *chloride of aluminum* succeeded with him perfectly; and a mixture of equal parts of these two salts proved to be an excellent injection to preserve dead bodies. He gives, however, the preference to *simple sulphate of alumina*, which is of ready preparation, and moderate price. It may be made by the direct combination of *alumina* and *sulphuric acid*. The salt contains 30 per cent. of the former to 70 of the latter. A kilogramme—about two pounds, eight ounces and a drachm and a half, Troy—dissolved in two quarts of water, was sufficient, in winter, to preserve a body fresh by injection for three months. To preserve it for a month or six weeks, it was not necessary to inject the blood-vessels,—an enema of one quart, and the same quantity injected into the œsophagus, were sufficient for this purpose. In hot weather, the solution must be stronger or in greater quantity, and it may be injected into the carotids.

It has been chiefly to prevent putrefaction in the dead body, that the salts of alumina have been employed; but they might, doubtless, be used with great advantage as external applications in all cases that require the topical employment of antiseptics. At the author's suggestion, they were so used in the Philadelphia Hospital, and were found to have an excellent effect in ulcers requiring an antiseptic and detergent

application. Two drachms of the sulphate to half a pint of water forms a good wash in such cases; but it may be made much stronger than this. After handling pathological specimens, the author has found a saturated solution of the salt remove the offensive odour more speedily and effectually than any other antiseptic.

11. CHLO'RINUM.—CHLORINE.

The vapour of chlorine has been recommended to be inhaled in cases of gangrene of the lungs, in which it has been found decidedly beneficial, correcting the fœtor of the breath and expectoration, and, therefore, calculated to obviate not only the local but the constitutional symptoms. *Aqua chlorini*, (Vol. ii. p. 326,) has been given in various diseases as an antiseptic,—for example, in typhus fever; malignant anthrax; scarlatina maligna; malignant dysentery; cancrum oris; gangrene of the lungs, &c. &c. Owing to the facility with which it experiences decomposition, it should not be prescribed in larger quantity than is necessary for twenty-four hours. The average dose in this time may be f.ʒj. It has been also used as an ablution to prevent venereal infection; to fœtid ulcers to correct the unpleasant odour, and excite a new action in the parts, and as a gargle in putrid sore throat. Baths of chlorine have been advised as an excellent means for preventing plague.

12. CALX CHLORINATA.—CHLORINATED LIME.

Chlorinated lime has been given in various affections in which chlorine as an antiseptic has been indicated. Both internally and externally, it has been employed in gangrenous ulcers; fœtor oris; gangrene, and other affections of the lungs, accompanied by offensive breath and expectoration; fœtid eructations; malignant dysentery, and typhus. It may be administered in the form of pill or dissolved in sugared water,—the dose being from gr. j to gr. vj, several times a day.

Externally, it has been employed in various cases;—in fœtid atonic ulcers; ozæna; cancrum oris; gangrene—both common and hospital; offensive conditions of the mouth, no matter whence arising; putrid sore throat; and wherever an antiseptic has appeared to be demanded. It may be employed as a lotion of varied strength, from ʒj to ʒss to Oss of water, the solution being decanted to remove the particles of lime from it; unless where it is considered advisable to permit the lime to remain, and be deposited upon the surface to which the solution is applied. In cases of very offensive discharges from the bowels, it may be added to an enema, in the quantity of ten or fifteen grains or more. Dentifrices are likewise made of it, and lozenges.

13. LIQUOR SODÆ CHLORINATÆ.—SOLUTION OF CHLORINATED SODA.

This solution is used as an antiseptic in the same cases as chlorinated lime, and has been, like it, prescribed both internally and externally. It is preferred by many for internal administration. The dose may be from ten drops to f.ʒj in plain or sugared water.

When applied externally, as an antiseptic to ulcers, &c., it may be diluted with from five to ten parts or more of water.

14. ACIDUM MURIATICUM.—MURIATIC ACID.

Liquid Muriatic, Chlorohydric or Hydrochloric acid, is obtained by subjecting a mixture of *Chloride of sodium* and *Sulphuric acid* to distillation, and condensing the chlorohydric acid gas in water contained in the receiver. The rationale of the process is the same as that for chlorohydric acid gas, (p. 369). It is, indeed, an aqueous solution of that gas; and, in the Pharmacopœia of the United States, is directed to be of the specific gravity 1.16. When pure, it is colourless, and is entirely volatilized by heat. When diluted with distilled water, it yields no precipitate with chloride of barium, which throws down a white precipitate if sulphuric acid be present; and it does not dissolve gold leaf even with the aid of heat, as it would do if chlorine were there.

Muriatic acid has been given internally in affections exhibiting a septic tendency, as in cynanche maligna, typhus, and cancrum oris; when it is usually associated with tonics, as cinchona or quassia. As a topical application, it has been used in cancrum oris, ulcerated sore throat, and foul ulcers. In the first case, it is sometimes applied slightly diluted; in the latter, more largely so. The proportion in a gargle may be from f.ʒss to f.ʒij of the acid to f.ʒvj of water. Internally, it may be given in the dose of from ℥v to ℥xx, properly diluted with water.

ACIDUM MURIATICUM DILUTUM, DILUTED MURIATIC ACID. (*Acid. muriat. f.ʒiv; Aquæ destillat. f.ʒxij.*) The specific gravity of this acid is 1.046.

SULPHURIC and NITRIC ACIDS, properly diluted, are used in similar cases.

15. CARBO LIGNI.—CHARCOAL.

Charcoal—whose general properties have been described already, (Vol. ii. p. 53,)—is possessed of strong antiseptic powers; and, likewise, exerts a decided tonic influence on the organism; hence it has been prescribed in dyspepsia, accompanied with fetid eructations; but has not been given internally to correct a septic tendency elsewhere than in the alimentary tube, as it is wholly insoluble. It is added to dentifrices partly on account of its power of correcting fœtor, and partly because it is well adapted, as a gritty powder, for cleansing the teeth. To fetid and putrescent ulcers it is most commonly applied in the form of poultice, mixed with crumb of bread and linseed meal. The dose of charcoal is from twenty grains to a drachm or more, given in syrup and water, or in the mineral water of the shops sweetened.

16. CREASOTUM.—CREASOTE.

The name creasote, (κρεας, “flesh,” and, σωτηρ, “preserver,”) sufficiently indicates the antiseptic powers which it possesses. It is rarely or never given, however, internally, for this purpose; but is sometimes applied to foul indolent ulcers, in which it both stimulates the parts to a better action, and prevents the putrefaction of secreted matters. It may, also, be used as a wash for the mouth in cancrum oris, and putrid sore throat. Its strength may vary from two to six drops to the fluid-ounce of water. A creasote wash is sometimes used for the mouth to correct fetid breath, especially when it arises from detention of the secretions and of extraneous matters in carious teeth.

EMPYREUMATIC ACETIC or PYROLIGNEOUS ACID, (Vol. ii. p. 136) is of unquestioned efficacy as an antiseptic,—the creasote which it contains being, doubtless, the main agent. It has been used in gangrene and sphacelus; in sloughing offensive sores; cancrum oris; in all cases of offensive discharges, and where antiseptics are indicated. It may be given internally in the dose of from five to thirty drops, three or four times a day, in water. Externally, it may be applied pure or diluted. It is also employed, at times, in the way of cataplasm, as an ordinary antiseptic solution. The strength may be f.℥ij of the acid to f.℥vj of water. In cancrum oris, it may be used of double the strength, or even pure.

17. CINCHONA, SULPHATE OF QUINIA, AND TONICS AND ASTRINGENTS IN GENERAL.

The different tonics have been given internally; and—as well as most of the astringents—have been applied externally to foul ulcers, and to gangrenous conditions. A poultice of powdered cinchona is a common application in such cases. The decoction of cinchona with acid is frequently used as a gargle to ulcerated sore throat. (*Decoct. cinchon.* f.℥vj; *Acid. muriatic.* f.℥ss.)

18. CEREVISIÆ FERMENTUM.—YEAST.

When an infusion of malt or wort is subjected to fermentation, a dirty greyish-brown substance gradually separates, forming a frothy scum and sediment, which constitutes *Yeast* or *Barm*. This appears to possess chemically many of the properties of gluten. It has been prescribed internally in the dose of f.℥j to f.℥ij, in typhus fever, and in scarlatina maligna, as a tonic and antiseptic, either alone or mixed with camphor water. It has, also, been given in the way of injection in typhoid tympanitis; but it is not much employed. Of the YEAST CATAPLASM, as an application to foul, ill-conditioned ulcers, mention has been made under another head. (See Vol. ii. p. 202.)

SECTION VIII.

AGENTS WHOSE ACTION IS PROMINENTLY MECHANICAL.

Modus operandi of mechanical agents—May affect the vital operations—The least important of our therapeutical resources.

SIMILAR general remarks to those that were made under the head of CHEMICAL AGENTS are applicable here. Although the classes, commonly ranked under the head of mechanical agents, may exert many of their properties in a purely mechanical manner, they still affect dynamically the vital properties of the tissues and secretions—and often in a decided way. In no other way, indeed, can we explain the effect of a demulcent, when given to allay irritation of the lining membrane of the air passages. The substance can only come in contact with that part of the pulmonary or gastro-pulmonary mucous membrane, which invests the top of the larynx. The portion of the membrane, actually affected with inflammatory irritation, cannot be reached by it; yet its effects are unequivocal; a soothing influence is exerted, and the cough, which is often nothing more than a symptom of bronchitic affection, is allayed. Many of the other agencies of demulcents, when used for the removal of internal disease, are equal exemplifications of the modification impressed upon the vital operations; and, therefore, in strictness of language, neither of the classes of remedial agents, usually ranked under this division, ought to be exclusively assigned to it, notwithstanding that some of their operations may be wholly mechanical;—as where a demulcent is used to shield or varnish an inflamed part; or a diluent to render less irritating a morbid secretion or deleterious substance.

Mechanical agents are generally esteemed the least important of our therapeutical resources; and perhaps they may be so. There are many morbid conditions, however, which admit of relief from them; and, occasionally, our therapeutical endeavours are restricted to their employment.

 1. DEMULCENTS.

SYNON. *Emollients, Relaxants.*

Definition of Demulcents—Of emollients—Not remedies of any activity—Therapeutical application—Are digested in the stomach—Therapeutical use of emollients—Special demulcents.

By most writers on therapeutics, the class of DEMULCENTS has been separated from that of EMOLLIENTS;—the former being made, by Dr. Paris, to comprise agents “which are capable of shielding sensible surfaces from the action of acrid matter, by involving it in a mild and viscid medium;” whilst the latter includes—“substances, whose application diminishes the force of cohesion in the particles of the solid

matter of the human body, and thereby renders them more lax and flexible." Their consideration, however, embraces so many points in common, that it may be well to keep them united; bearing in mind, at the same time, that they are capable of producing the effects comprised in both of the above definitions, and are often employed accordingly. Dr. A. T. Thomson uses the word demulcents synonymously with emollients and relaxants; and defines them "substances, which diminish the vital tension of tissues and lessen acrimony by lubricating, softening, and rendering more flexible the solid part of the body."

Demulcents—as employed for the first of the purposes referred to by Dr. Paris—are not remedies of any activity; but they are agents, that may be employed with advantage in various forms of disease to which the French have appropriated the name *catarrh*;—that is, in increased discharges dependent upon inflammatory or other irritation of mucous membranes. Yet, their efficacy must obviously differ somewhat, according to the facility with which they may be made to come in contact with the seat of the increased discharge, or of the inflammatory irritation. Accordingly, in gastro-enteritic affections, they are perhaps most beneficially employed; and since the views of Broussais have been before the medical world, demulcents have been more frequently used in those affections than formerly. It has been a reproach, indeed, against the medical practice of that celebrated systematist, that the remedial efforts were too frequently confined to shielding or varnishing the lining membrane of the stomach, by substances belonging to the class under consideration; but whatever doubt may be had, respecting the effects of demulcents in such cases, there can be but little, that their use occasionally prevents the practitioner from the adoption of more perturbing means; and therefore that the demulcent medication is often, negatively, of essential utility.

Even where the enteritic affection is seated lower down the tube than in the portion which suffers under gastro-enteritis, demulcents may be useful. When it is in the mucous membrane of the stomach, the nature and action of the demulcent is at first unchanged; but when the seat of the disease is lower, the agent undergoes either stomachal or duodenal digestion, or both; and therefore its *modus operandi* must be materially modified. In the latter case, the soothing effect is exerted on the membrane lining the supra-diaphragmatic portion of the tube and the stomach; and by continuous sympathy the effect is propagated along the membrane to the portion affected by inflammatory irritation.

It is in this mode, that dietetic demulcents may be serviceable in enteritis, even when it is far down the tube—as in the mucous membrane of the large intestines in dysentery. They exert an immediately soothing influence on the gastric mucous membrane, and in addition, the excrementitious portion which is sent on through the canal is as devoid of irritating qualities as any fecal matter can be. Hence, the farinaceous decoctions—as of arrow-root, sago, tapioca, &c.—become not only dietetic, but medicinal agents belonging to the class under consideration; and are therefore placed by pharmacologists amongst demulcents.

These are cases, in which the remedial agent is made to come in

contact—directly or indirectly—with the diseased part ; and it will be readily understood, that the remarks apply to every condition of the gastro-pulmonary mucous membrane, or, indeed, of any mucous membrane, where similar circumstances exist ; but, not unfrequently, demulcents are prescribed for affections of mucous membranes with which they cannot be brought into immediate contact, or, perhaps, into contact at all, inasmuch as they must previously pass into the blood, and be eliminated by some emunctory, before they can attain the seat of the disease. Such must be the case, where demulcents are administered by the mouth for the cure of diseases of the urinary organs. To produce any effect, they must enter the circulation unchanged. This, it has been seen, cannot be the case ; and, much as it conflicts with vulgar belief, and even with the sentiments of many practitioners, it may be laid down as a fact, that the different mucilaginous drinks—gum water, flaxseed tea, &c., administered in gonorrhœal and other inflammatory irritations of the urinary organs—exert no more remedial agency than so much pure water. They act altogether as diluents. Such is the inference which the author has deduced from repeated examination of the urine, when mucilaginous drinks have been freely taken ; and the same deductions have been made from similar observations by Dr. Paris. “ In parts,” he observes, “ beyond the reach of the first passages, and to which no fluid can arrive but through the medium of the secretions, it is very difficult to explain the principle upon which their beneficial operation can depend ; and it seems indeed highly probable, that they act in such cases as simple diluents, for the process of digestion must necessarily deprive them of their characteristic viscosity. The administration of demulcent drinks in gonorrhœa is probably of no further service in assuaging the *ardor urinæ* than an equivalent quantity of pure water ; although Dr. Murray observes, ‘ it is sufficiently certain that many substances, which undergo the powers of digestion, are afterwards separated in their entire state from the blood by particular secreting organs ; and there is,’ continues he, ‘ no gland which has the power more particularly than the kidneys ; substances, received into the stomach and digested afterwards, passing off in the urine with all their peculiar properties.’ This is undoubtedly true ; but mucilaginous substances rarely or never pass off in this manner ; if they evade the assimilative functions, they pass through the alimentary canal, and are thus eliminated. I can state, as the result of experiment, that the urine undergoes no change, except in the relative proportion of its water, by the copious and repeated administration of mild mucilages. Dr. Saunders has very justly remarked, that “ the long list of ptisans, decoctions, &c., usually prescribed upon these occasions, generally owe their virtues to the watery diluent itself.”

Yet it is hard to abandon opinions that have been cherished for ages, and apparently supported by *experience* ; and hence we occasionally witness attempts made to support the practice by the suggestion that a part of every demulcent may escape digestion, and enter the current of the circulation. “ Substances,” says Professor Thomson, “ that produce a demulcent effect are taken into the stomach, and apparently act upon distant organs. A question arises, suggested by the nature of

the substances, what effects has digestion upon them? Undoubtedly, a large portion of almost every demulcent taken into the stomach is digested; but some part of them, at least, escapes this process, and is carried into the system."

But even if we admit, that a small portion of the demulcent *may* pass into the system—of which, however, we need evidence—we are amply justified in inferring, that the quantity must be too minute to exert any influence upon distant organs; that, consequently, whatever effect is induced must be through the agency of the water with which the demulcent is combined; and that the demulcent itself acts, in such cases, as a simple nutrient only.

Next to affections of the lining membrane of the digestive apparatus, those of the membrane lining the air passages are most frequently treated by demulcents combined with other agents, according to the greater or less urgency of the case. In these affections, it would not seem, that much advantage ought to be expected from such agents, unless the inflammatory irritation be seated so high up the larynx, that the demulcent can come in contact with it; but experience shows, that here, as in inflammatory irritations of the lower part of the intestinal tube, benefit may be derived through the means of continuous sympathy;—that is, by soothing the top of the larynx, the salutary influence may extend lower down, and may relieve the cough, although the seat of the pathological affection, which occasions it, may be in the minute bronchial ramifications. Hence it is, that emulsions, mucilages, syrups, troches, &c., are so commonly prescribed with benefit, in cases of cough. But the agency of these substances has already been fully treated of. (See Vol. i. p. 240.)

As regards EMOLLIENTS, or agents whose application diminishes the force of cohesion in the particles of the solid matter of the body, and thereby renders them more lax and flexible;—much of their operation must obviously be mechanical. When we rub an emollient substance into a part that is unusually rigid, the substance insinuates itself between the particles of the tissue, which thus becomes softened and relaxed. Yet, even here, some degree of dynamic action may be caused by the remedial agent, and a soothing influence be exerted, which may, in some measure, reduce tension by modifying the functions of innervation and circulation of the part. One of the most common cases for the employment of emollients is during a natural process. When the perinæum, in parturition, is more than usually rigid, and does not yield readily to the pressure of the head of the child, the obstetrical practitioner recommends, that lard should be freely rubbed on the perinæum, or that the female should sit over the steam of hot water. Often, perhaps, not much effect is exerted by this course; but, at times, relaxation of the parts, and delivery would seem to be expedited by it. In like manner, when severe sprains have been received, recourse is had to the application of warmth and moisture. It is well known, that where swelling speedily succeeds any violent torsion of the joints, the pain is by no means as severe as when the same extent of mechanical injury is inflicted without an equal amount of tumefaction. It would seem, therefore, that if we could

facilitate the tumefaction in any manner, we might afford relief. Accordingly, in severe sprains of the ankle, if we advise that the extremity be kept for some time in warm water, we are often gratified to discover, that the agony is rapidly mitigated.

It has been properly remarked by Dr. Paris, that although we may be disposed to consider the principle—if not the whole—of the operation of emollients, in the cases alluded to, to be of a mechanical character, the beneficial effects of cataplasms and fomentations cannot be so explained; “for, in these instances, none of the materials can be absorbed through the entire cuticle; and yet the relaxation and consequent ease, which such warm applications produced on inflamed surfaces, is very considerable, but it must be wholly attributed to the relaxing effects of warmth and moisture upon the extreme vessels of the surface, propagated by *contiguous sympathy* to the deeper seated organs.”

In previous parts of this work, reference has been made to the effects which caloric of different intensity is capable of producing; and it was then remarked, that its agency is various according to the degree;—heat, greater than that of the human body, stimulating; whilst, when lower than that of the body, it is soothing and sedative. According, therefore, to the amount of heat will be the effect produced on the vital functions. In inflammations of deep-seated organs—as of the peritoneal coat of the intestines—a hot fomentation, although it may excite the organic actions of the part with which it is made to come in contact, may act as a revellent; and, in this way, be beneficial like other revellents; whilst a warm fomentation, by virtue of the soothing and relaxing influence of the warmth and moisture, may—through the extensive sympathy that exists between every part of the capillary system—have its soothing influence extended to capillaries that are under inflammatory excitement. It may be asked, however, whether, in this case, the inflammation be relieved by contiguous sympathy, or by the general effect, which the relaxant application exerts on the whole capillary system of vessels. It is probable, that the result is produced in both ways. It has been seen, that the sedative influence, occasioned by the abstraction of caloric from a part of the frame,—in cases of that excited condition of organic actions, which constitutes fever,—is as effectually and surely exerted, as when the cooling medium is made to come in contact with the whole cutaneous surface. In internal inflammations, the use of soothing fomentations and cataplasms may have a like agency; but a part of the effect is, doubtless, also produced on the suffering organ, through the sympathy of contiguity, although this may not be so much concerned in the curative operation as has been imagined. In the case assumed—of inflammation of the peritoneal coat of the intestines—the capillaries, affected by the disease, and by the local application, have nothing in common. The whole of the anatomical elements are as different as if the remedy were placed upon one of the extremities, and yet the effect is often signal: the main result is manifestly one of revulsion,—the new impression, made on the organs of circulation and innervation of the part, detracting from the concentration of the vital manifestations elsewhere.

Lastly; in the *modus operandi* of emollient cataplasms in external inflammation, we have an example of a more complex agency than might, at first sight, appear. Although the warmth and moisture doubtless act mechanically, and diminish the cohesion of the parts, the sanative effect is not owing to this circumstance, but to the soothing influence before referred to. Hence, a warm cataplasm or fomentation is a valuable remedy in many cases of external phlegmasia, even from their very inception. When such inflammation is apt to terminate in suppuration, those applications are universally had recourse to; and as they seem to favour suppuration, they have—by the unprofessional especially—been esteemed improper in ordinary cases of external inflammation, in which suppuration is not threatened, or not to be encouraged. The opinion is, however, erroneous. The effect of the warmth and moisture of the cataplasm is, in both cases, soothing. In the commencement, therefore, of inflammation, it is a useful agent; and, when the organic actions of the part are so over excited as to threaten some of the less favourable terminations of inflammation, it reduces them to that point, which is requisite for the existence of suppurative action. The vulgar believe, that a cataplasm, in such case, is “drawing,” and that it thus expedites the pointing of the abscess. The cataplasm, or the fomentation, acts merely by virtue of its warmth and moisture. Both lessen organic actions, when inordinately exalted; both diminish cohesion in the parts to which they are applied; and by virtue of this relaxant property, if their application be too long continued, they often occasion sloughing of the integuments and extensive scars. This is not unfrequently the case in inflammation of the *mammæ* ending in suppuration; and, therefore, it is wise to be careful as regards their too protracted use;—otherwise, the tone of the blood-vessels may be destroyed; the inconveniences, above depicted, be experienced, and convalescence be tedious and distressing.

SPECIAL DEMULCENTS.

a. *Internal Demulcents.*

1. ACA/CIA.—GUM ARABIC.

Gum Arabic—whose properties as a demulcent expectorant have been described elsewhere, (Vol. i. p. 240,)—is one of the demulcents most commonly employed whenever any of the class are indicated; and since the introduction of the doctrines of Broussais, it has been given not only as a nutrient, but as a therapeutical agent in inflammatory affections of the stomach and intestines. The common mode of exhibiting it, is to dissolve an ounce of the *gum* in a pint of *water*, and to allow this *gum water* to be taken *ad libitum*. It is well adapted for inflammatory affections of the gastro-intestinal mucous membrane, not only on account of its sheathing the inflamed surface, but of its affording a slight and unirritating excrement.

2. LINUM.—FLAXSEED.

Flaxseed tea—INFUSUM LINI—is much prescribed by the profession, in all cases in which demulcents are considered to be indicated; and is greatly used by the *laity*. It possesses the ordinary virtues of demulcents, and may be employed in the manner advised under *Demulcent Expectorants*, (Vol. i. p. 240).

3. SESAMUM.—BENNE.

Benne leaves—whose properties are described under *Demulcent Expectorants*—are much used, in the southern States especially, to form a mucilaginous infusion, which is a popular remedy in diarrhœa, dysentery, cholera morbus and cholera infantum; as well as in other cases which appear to require the employment of demulcents. It possesses no virtues, however, not equally possessed by gum arabic, and other mucilaginous demulcents. The mode of preparing the mucilage is given in the first volume, (p. 251).

4. ULMUS.—SLIPPERY ELM BARK.

Slippery elm bark is a demulcent much used in diarrhœa, dysentery, cholera morbus and cholera infantum; and in all diseases in which demulcents are considered to be appropriate. It is given in the form of infusion, described elsewhere, (Vol. i. p. 252).

5. ALTHÆA.—MARSHMALLOW.

Decoction of marshmallow, (Vol. i. p. 242,) is used in the same cases as gum arabic. The formula for DECOCTUM ALTHÆÆ, of the Dublin Pharmacopœia, is as follows:—*Althæa root*, dried, ʒiv; *Raisins*, freed from the seeds, ʒij; *Boiling water* Ovij; to be boiled down to five pints and strained. It may be taken as drink, in the dose of a pint or more, in the twenty-four hours.

6. SAS'SAFRAS MEDUL'LA.—SAS'SAFRAS PITH.

The pith of *Laurus sassafras*—as elsewhere remarked, (Vol. i. p. 251,)—contains a large quantity of gummy matter, which is imparted to water, so as to form a mucilaginous solution; and has been used as a demulcent drink in all cases in which those drinks are required. It may be made by adding a drachm of the *pith* to a pint of *boiling water*; and may be taken *ad libitum*.

7. TRAGACAN'THA —TRAG'ACANTH.

Tragacanth, whose properties are fully described elsewhere, (Vol. i. p. 250,) is possessed of demulcent properties; but is very rarely, or never, prescribed as such.

8. GLYCYRRHIZA.—LIQUORICE ROOT.

Liquorice root, whose demulcent properties as an expectorant have been fully described already (Vol. i. p. 248,) is occasionally em-

ployed in diarrhœa and dysentery; and in affections of the urinary organs, which seem to require the use of a demulcent. It is also added to acrid substances, as mezereon, with the view of covering their acrimony, and of rendering them more palatable. It is not often employed, however, as a demulcent; and is of very restricted efficacy. It is given in decoction, (*Glycyrrhiz.* ʒj; *Aquæ* Oj, boiled for a few minutes.)

The extract—**EXTRACTUM GLYCYRRHIZÆ**—may be used for the same purpose.

The different varieties of SUGAR possess analogous properties, and the same may be said of

9. UVA PASSA.—RAISINS.

Raisins or dried grapes are the fruit of *Vitis vinifera*—the *vine grape-vine*; NAT. FAM. Sarmenaceæ, of Decandolle,—Vitaceæ, of Lindley; SEX. SYST. Pentandria Monogynia. They are chiefly prepared in

Fig. 164.



Vitis vinifera.

Spain; and in the Levant; whence they have been called Valentias and Smyrnas; and also in Afghanistan, whence they are taken to India. The Malaga raisins are esteemed the best of those that are imported into this country. The larger dried grapes go by the name of raisins; the smaller—obtained chiefly from the Ionian Islands—are termed *currants*, an abbreviation of *Corinthians*. They have been often called respectively in the pharmacopœias, *Passulæ majores* and *Passulæ minores*. All contain a considerable portion of grape sugar—*glucose*—which differs from cane sugar in being less soluble in water or alcohol, and less sweet. It is considered by the chemist to be identical with that produced by the action of sulphuric acid on starch.

Raisins are rarely or never given alone. They are possessed of demulcent properties; and are added to preparations having those characters,—as the Decoctum Althææ, the Decoctum Hordei compositum, &c., of British pharmacopœias.

10. CETRA'RIA.—ICELAND MOSS.

So much has been said of the general and demulcent properties of Iceland moss, (Vol. i. p. 252,) that it is unnecessary to do more in this

place than remark, that it has been employed as a demulcent and nutrient in diarrhœa and dysentery, as well as in affections of the air passages.

The same remarks apply, also, to

11. CHONDRUS.—IRISH MOSS,

which is used in similar cases, (Vol. i. p. 253,) and to,

12. FUCUS AMYLACEUS.—CEYLON MOSS.

(See Vol. i. p. 254).

13. HORDEUM.—BARLEY.

Barley—in the Pharmacopœia of the United States—means the decorticated seeds of *Hordeum distichon*, *Common* or *long-eared barley*; SEX. SYST. Triandria Digynia; NAT. ORD. Gramineæ; which is a native of Tartary, but is cultivated in different parts of the world.

Fig. 165.



Hordeum distichon.

Fig. 166.



Hordeum vulgare.

Fig. 167.



Hordeum hexastichon.

When deprived of its integuments by a particular process, it constitutes *Pearl barley*—*Hordeum perlatum*; and when this is ground to powder, it forms *patent barley*. Ground barley is barley meal. Pearl barley is officinal in the Pharmacopœia of the United States, as well as in the pharmacopœias of Great Britain.

Ripe barley-corns, according to Einhof, consist of 18.75 per cent. of husk; 70.05 of meal, and 11.20 of water.

The husks are said to be slightly acrid and laxative: when deprived of these, barley forms a nutritious aliment, and one that is easy of digestion. In the form of *barley water*, which is made by boiling it in water, it is much used as a demulcent drink in febrile and inflammatory dis-

eases; especially in various inflammatory conditions of the mucous membrane of the air tubes and alimentary canal. The Pharmacopœia of the United States contains a form for

DECOCTUM HORDEI, DECOCTION OF BARLEY. (*Hordei* ℥ij; *Aquæ* Oivss. The extraneous matters that adhere to barley are directed to be first washed away with cold water; half a pint of the water is then poured upon it, and boiled for a short time. Having thrown away this water, the remainder is poured, boiling hot, on the barley; and the liquid is boiled down to two pints and strained.) The barley is washed with cold water, and boiled for a short time, to remove any extraneous substance or flavour which it may possess. It may be used *ad libitum* as a nutritive and demulcent drink.

The London and Dublin Pharmacopœias have a **DECOCTUM HORDEI COMPOSITUM**,—termed “compound,” owing to the addition of figs, liquorice-root and raisins,—which is employed in the same cases as the simple decoction.

14. MARANTA.—ARROWROOT.

Arrowroot is the fecula of *Maranta arundinacea*, *West Indian arrowroot*; SEX. SYST. Monandria Monogynia; NAT. ORD. Marantaceæ; a plant, which is a native of South America and the West Indies, where it is largely cultivated in gardens and provision grounds. The tubers or roots are beaten into a pulp, stirred with cold water, removing the fibres with the hand; the milky juice is passed through a fine sieve, and the starch is allowed to subside in the strained fluid. The fecula is then washed, and dried without heat. This is *Arrowroot*.

It is imported from the West Indies, and the northern and western parts of South America, in tin cases, and in barrels and boxes. Bermuda arrowroot is considered to be the best. The quantity, according to Mr. McCulloch, entered in England for home consumption, on an average of three years ending with 1831, amounted to 441,556 pounds *per annum*. It is snow-white, faintly glistening, and devoid of odour and taste; is in powder, or in small pulverulent masses, which, when pressed between the fingers, cause a slight crackling noise. When examined by the microscope, it is found to consist of minute particles, which are generally elliptical, or irregularly shaped, having small mammillary processes occasionally projecting from some portion of the surface. Many are only 1-2000th of an inch in their longest diameter; others are twice as long; and a few attain 1-750th of an inch; but none are larger. The breadth is generally two-thirds of their length. M. Raspail describes their form as that of a half, a fourth, or a third of a solid sphere, which by no means corresponds with the true form of the granule of West Indian arrowroot. Dr. Carson, of Philadelphia, is of opinion that Raspail examined Florida arrowroot, the granules of which are of the shape he mentions. Dr. Pereira states, on the authority of Payen, that Raspail has depicted the grains of the fecula of *Convolvulus Batatas*, *Sweet Potato*, for arrowroot.

West India arrowroot is said to be often counterfeited by the substitution of the East India variety, or of the potato-starch, or of the starch of *Canna coccinea*, introduced not long ago into commerce under the name of *Tous-les-mois*. The readiest mode of detecting these frauds, according to Dr. Christison, is by means of a good microscope. The globules of potato starch are very unequal in size, for the most part elliptical, many of them 1-500th or 1-400th of an inch in length; and some even as large as 1-300th. The globules of tous-les-mois are generally elliptical; many of them 1-300th of an inch in length, and some even as much as 1-200th. On account of the greater size of the globules of these two varieties, they present to the naked eye a much more glistening appearance than arrowroot; and this character is said to be sufficient to distinguish them in the hand of an experienced person.

It is apt to acquire the odour of the ship, which, together with dampness, gives it occasionally a musty taste and smell, that render it unsaleable. These objectionable qualities can be removed by washing in cold water, and drying it.

Arrowroot presents all the chemical characters of wheaten starch, than which it is considered by Dr. Prout to be a lower variety of starch. It makes, however, a much firmer jelly with the same quantity of boiling water,—nine parts of arrowroot being equivalent, in this respect, to fourteen of wheaten starch.

As an aliment, it is considered to be less nutritive than wheaten starch, but more palatable and digestible. No sufficient comparisons have, however, been made between them. Boiled in water or milk, it is a very common, and favourite aliment in febrile and inflammatory affections; in chronic diseases, and in convalescence from the acute. Lemon-juice, or wine, or spirit, according to circumstances, is added to the watery decoction. In all cases in which demulcents are indicated, it is especially appropriate as an article of diet. Opinions differ in regard to the action of arrowroot and milk on the digestive function: whilst some believe its tendency is to constipate, others ascribe to it an opposite action. Its effects in this respect are not marked.

Different forms of fecula have received the name of arrowroot. PORTLAND ARROWROOT or Portland sago is obtained from *Arum maculatum*; BRAZILIAN ARROWROOT is the fecula of *Jatropha manihot*; and TAHITI ARROWROOT, or *Tahiti* or *Otaheite salep*, is the fecula of *Tacca pinnatifida*.

15. EAST INDIAN ARROWROOT is the fecula of the tubers of *Curcuma angustifolia*, *Narrow-leaved turmeric*; SEX. SYST. Monandria Monogynia; NAT. ORD. Zingiberaceæ; a plant, which is indigenous in the East Indies. It is commonly white, sometimes pale yellow; less crepitating

Fig. 168.



Tacca pinnatifida.

Fig. 169.



Particles of Tahiti Arrowroot. (Pereira.)

Fig. 170.

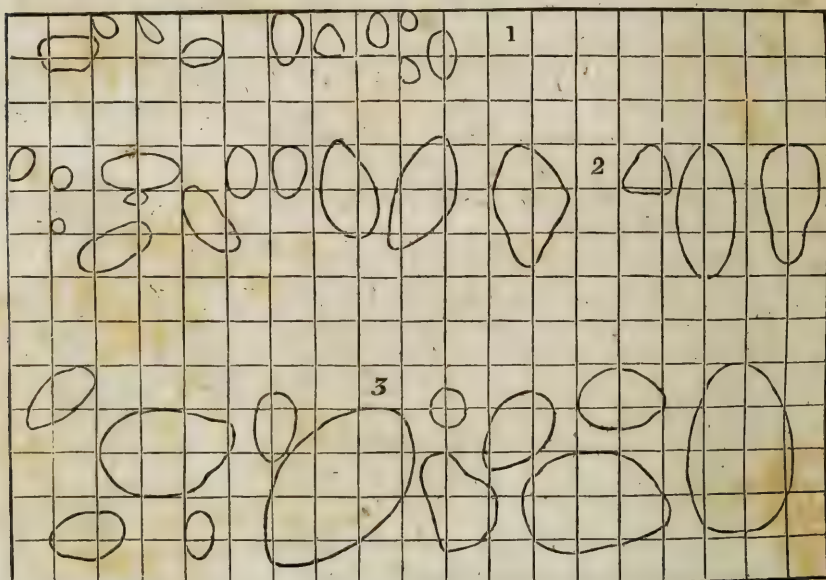


Particles of White East India Arrowroot. (Pereira.)

between the fingers than the best West India arrowroot; more frequently mixed with impurities, and composed of larger granules, which are unequal in size, egg-shaped, compressed, often with a very short neck or nipple-like projection. Its composition is not ascertained. It does not make so firm a jelly with boiling water as the West India variety. Dr. Christison states, that a sample, sent to him from Liverpool, and represented to have been obtained from the West India plant cultivated in Bengal, exactly resembled Bermuda arrowroot, and presented the very same appearance under the microscope.

The commercial value of East India arrowroot is far below that of the West India.

Fig. 171.



Particles of Arrowroot, Potato-starch and Tous-les-mois as seen through the microscope on a micrometer, whose squares measure one-thousandth of an inch.—(Christison.)

1. Globules of West India and East India Arrowroot.
2. Those of Potato-starch, prepared in Dr. Christison's laboratory.
3. Those of Tous-les-mois from St. Kitts.

16. **FLORIDA ARROWROOT** has generally been referred to *Maranta arundinacea*, the plant that affords Bermuda arrowroot; but Dr. Carson has shown that this is an error, and that it is derived from *Zamia integrifolia*, or *Z. pumila*; NAT. ORD. Cycadaceæ, which appear to be only found in Florida. The tubers also contain large quantities of a feculent substance, and are used as an article of food by the Seminole Indians. They are prepared by roasting; and were eaten by the white inhabitants, and the army of Florida, as a substitute for potatoes.

Fig. 172.



Particles of West India Arrowroot. (Pereira.)

The fecula is obtained from the tubers in the same manner as arrow-

root from the tubers of *maranta arundinacea*. Coarse specimens of the farina of the saw palmetto—*chamærops serrulata*, were presented to the author some years ago. It was evidently impure, and this may account for its inducing bowel complaints in the Indians who use it as diet. Of the rude mode in which they prepare it, the author has given an account in the *American Medical Intelligencer* for August 1, 1838, on the authority of General Persifer F. Smith in a letter to C. Roberts, Esq., of Philadelphia.

Florida arrowroot, as well as the farina, is known in the Southern states by the name *coonti* or *coontie*. When compared with Bermuda arrow-root, it has a more mealy appearance and feel; and is of a duller white colour, with less of the crystalline lustrous hue. If carefully prepared, however, it is pure white; but is apt to be lumpy, like the fecula obtained from tapioca root. (Carson.) Its main characters under the microscope have been already described.

17. **Tous-LES-MOIS.** Under this name, a fecula has been introduced into commerce, which is ascribed to *Canna coccinea*; but, according to the Edinburgh Pharmacopœia, it is the fecula of the root of an imperfectly determined species of *canna*. It is exported from St. Kitts, and is prepared from the root of the plant. It is distinguished under the microscope by the large size of its granules, and by the other characters mentioned under arrowroot.

Tous-les-mois has a slightly satiny appearance, and is devoid of the dead white or opaque character presented by certain amylaceous substances. According to Dr. Pereira, it approaches most nearly to potato-starch; but its particles are larger. It makes a stiffer jelly than arrowroot; for which it may be substituted in all cases.

18. **ENGLISH ARROWROOT, Common arrowroot, French sago, Potato-starch,** is the fecula obtained from the tubers of *solanum tuberosum*, *common potato*. It is prepared much in the same manner as other varieties of fecula. The appearance of its granules under the microscope has been referred to under arrowroot. When carefully prepared, it is equally agreeable with, and probably as nutritious as Bermuda arrowroot. It is often, indeed, substituted for it; and, when boiled in milk or water, the difference is not easily distinguishable.

Fig. 173.



Particles of Tous-les-mois. (Pereira.)

Fig. 174.



Particles of Potato-starch seen by the microscope. (Pereira.)

- a. Normal Starch particle. (Fritzsche.)
- b. Irregular ditto.
- c. d. Particles each having two hila.
- e. f. g. Particles broken by pressure and water; the internal matter remains solid. (Payen.)

19. TAPIO'CA.

Tapioca is the fecula of the root of *Jatropha manihot* or *Janipha*

Fig. 175.



Janipha Manihot.

cakes, *Cassava* or *Cassada bread*.

Tapioca is met with in the shops either in lumps or granules, or in powder; and is imported from Bahia and Rio Janeiro.

Fig. 176.



Particles of Tapioca as seen by the microscope. (Pereira.)

It is an excellent nutrient and demulcent, and is adapted for the same cases as arrowroot. It makes a firmer jelly with boiling water than most feculaceous substances, and requires longer boiling.

A factitious tapioca is met with in the shops, which is in very small, smooth, spherical grains, and is supposed to be prepared from potato starch. It is sold under the name of *pearl tapioca*. (Wood and Bache.)

Fig. 177.



Sagus Rumphii.

a. The tree. c. Fruit-bearing spadix.
b. The shrub. d. Ripe fruit.

20. SAGO.

Sago is the prepared fecula of the pith of *Sagus Rumphii*,—*Malay* or *Rumphius's sago palm*; SEX. SYST. Monœcia Polyandria; NAT. ORD. Palmæ; which is indigenous in Malacca, and the islands eastward of the Bay of Bengal. It is also obtained from *Sagus lævis*, *Unarmed sago palm*; and *Suguerus Rumphii*, *Rumphius's wine sago palm*. The farina is procured from the pith in the same manner as the feculæ already considered. When first obtained by subsidence in cold water, it is called *raw sago meal*.

The finest portions of this are mixed with water, so as to form a paste, which is rubbed into small grains.

Three kinds of sago are met with in the shops,—*sago meal*, *common sago*, and *pearl sago*. Sago meal is in the form of a fine amylaceous powder, of a whitish colour, with a buffy or reddish tint, and has a feeble peculiar odour. Common or brown sago is in grains of about the size of pearl barley; but Dr. Pereira states that he has seen some as large as green peas. It is of a whitish or brownish-white colour. Pearl sago is in small hard grains, of about the size of a pin's head, which are of a pale yellowish-white, reddish-white, or grayish-white colour, or are translucent. It is sometimes bleached with chlorinated lime. When the different varieties are examined by the microscope, they appear to consist of oval or more or less ovate particles, many of which are more or less broken in sago meal; in common sago, they are somewhat more broken and less regular in their shape; and in pearl sago they are ruptured,—peculiarities which are considered to be produced by the process of granulation. (Pereira.)

Fig. 178.

Particles of Sago meal.
(Pereira.)

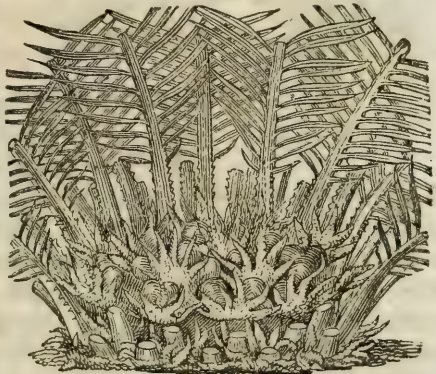
Fig. 179.

Particles of potato sago.
(Pereira.)

Sago possesses the ordinary properties of starch, and is used as a demulcent and nutrient in the same cases as arrowroot and the other feculaceous substances already considered. A table-spoonful gives the proper consistence to a pint of milk or water.

Several species of Cycadaceæ, which are allied to the Palmæ, contain, in the cellular structure within their stem, an abundance of starch, which may be separated in the same manner as sago. These species are *Cycas circinalis*, *C. revoluta*, and *C. inermis*. They furnish *Japan sago*, which, perhaps, never reaches Great Britain or this country. (Pereira.)

Fig. 180.

*Cycas revoluta*, or the Japan Sago-tree.

21. SALEP is not admitted into the pharmacopœias of Great Britain or into that of the United States. It is the prepared roots of several orchideæ, and is sometimes sold in powder. The salep of Cachmere is produced from a species of *Eulophia*; that of Europe from native plants—*Orchis mascula*, *O. latifolia*, &c. It is possessed of similar properties with tapioca.

Certain powders—termed *Castillon Powders*, from the name of the physician who first employed them—have been prescribed in this country, in cases of diarrhœa and dysentery; and, as demulcents, have been productive of advantage. They are formed of *sago*, in powder; *salep*, in powder; *tragacanth*, in powder; of each, four parts; *prepared oys-*

ter shells, one part; *cochineal*, half a part;—divided into powders of one drachm each; one of which is given three or four times a day. The prepared oyster shells adapt them for certain forms of diarrhoea, (see Vol. ii. p. 148,) and the cochineal is a mere colouring agent. One of these powders, mixed with a little milk or water, and added to a pint of boiling milk or water, forms an article of diet as well as of medicine in these cases; but it need scarcely be said that there is no special virtue in the combination.

22. AVE/NÆ FAR/NA.—OATMEAL.

Oatmeal is the meal prepared from the seeds of *Avena sativa*, common oat; SEX. SYST. Triandria Digynia; NAT. ORD. Gramineæ, the native country of which is unknown; but it appears to grow wild in several places throughout Europe, and is cultivated there and in this country. Deprived of their covering, oats are termed *groats*; and, when crushed, *Emden groats*.

Fig. 181.



Avena sativa.

According to the analysis of Dr. Christison, oatmeal consists of 72.8 per cent. of starch; 5.8 of saccharo-mucilaginous extract of a feebly sweetish taste; 3.2 of albumen; 0.3 of oleo-resinous matter; 11.3 of lignin, in the form of coarse bran; and 6.6 of moisture. Scotch oatmeal, consequently, appears to contain nearly five-sixths of nutriment; and the proportion must be greater when the seeds are carefully freed from the husk and integuments before being ground.

As a bland farinaceous nutriment, oatmeal is often made into *gruel*, and taken in cases of sickness—especially in fevers and inflammatory affections. It is generally termed *water gruel*, and may be made by boiling three ounces of oatmeal or groats in three pints of water down to a pint and a half; and straining. It is a favourite domestic article of diet in sickness. In Scotland and the north of England, oatmeal is stirred into boiling water, until it has the proper consistence on cooling; when it bears the name of *porridge*, and is eaten with milk as an article of diet. When the husks, removed from the oats before they are ground, are infused in hot water, and allowed to become sourish, a mucilaginous liquid is obtained by expression; which, when concentrated, forms a firm jelly called *sowins*, also used as an article of diet.

Gruel is a common drink after cathartics, to assist their operation; and it is an excipient for emollient and cathartic enemata.

In the United States, especially in the southern and western portions, an excellent gruel is made from the farina of *Zea mays*, *Indian* or *corn meal*.

23. AMYLUM.—STARCH.

Starch is the fecula of the seeds of *Triticum vulgare*, common wheat; SEX. SYST. Triandria Digynia; NAT. ORD. Gramineæ; which is said to be a native of the country of the Baschkirs, but is cultivated in Europe and this country. It is contained, also, in various plants, but is especially abundant in the seeds of the *cereal*ia, of which it forms between sixty and seventy-five per cent. Arrowroot, sago, tapioca, tous-les-mois, potato-starch, &c., are varieties of it. It is never prepared by the apothecary.

When pure, wheaten starch is of a white colour; devoid of odour, and almost of taste. It is not soluble in alcohol, ether, or in cold water; but with boiling water forms the DECOCTUM AMYLI or MUCILAGO AMYLI of the British pharmacopœias, which is made by boiling 4 or 6 drachms of *starch* in a pint of *water* for a short time, and is chiefly used as an enema, and an excipient for opium administered in that manner. It is rarely or never given internally.

Starch powder or hair powder is occasionally dusted on parts to absorb acrid secretions, and prevent excoriation.

Fig. 182.



Particles of Wheat Starch.

a. A particle seen edge-ways. (Pereira.)

24. AMYGDALA.—ALMONDS.

Almonds, when formed into an emulsion—MISTURA AMYGDALÆ of the Pharmacopœia of the United States, (see Vol. i. 321,) is used in all cases in which demulcents are indicated; but most frequently as a demulcent expectorant. It is often prescribed in diseases of the urinary organs, with the view of diminishing the acrimony of the urine, in which, however, it is probably devoid of all efficacy.

An emulsion is sometimes made of OLEUM AMYGDALÆ, (Vol. i. p. 168,) which is employed in the same cases. It may also be prescribed in the dose of a tea-spoonful, mixed or not, with syrup; and the same may be said of OLEUM OLIVÆ, (Vol. i. p. 168).

25. CETA/CEUM.—SPERMACETI.

Spermaceti, (Vol. i. p. 246,) possesses the properties of the fixed oils; and, besides its employment as a demulcent expectorant, it has been occasionally prescribed in diarrhœa and dysentery; but it has fallen into disuse, and is now never given except in the preparation of ointments. When used internally, it is in the form of emulsion, as described in the part of this work above referred to.

26. SEVUM.—SUET.

Sevum of the Pharmacopœia of the United States is the prepared suet of *Ovis aries*, the *sheep*. It is obtained from the neighbourhood of the kidney, and is prepared by melting it over a slow fire, and straining

through linen or flannel to separate the solid portions. It resembles lard in its properties, but is firmer, and requires a higher temperature to melt it.

It has been used in domestic practice, boiled with milk, in diarrhœa and dysentery; but is almost wholly employed in pharmacy, to give a greater degree of consistence than lard to ointments and plasters.

27. CERA FLAVA.—YELLOW WAX;

AND

28. CERA ALBA.—WHITE WAX.

Wax was at one time supposed to be a secretion from plants, which was simply transferred to the body of *Apis Mellifica*, the bee; but it has been since proved to be formed by the insect itself. A vegetable wax is, however, occasionally secreted by plants. The wax of the bee is intended to construct the comb. It is obtained for medical use, by allowing the honey to drip from the comb; or by subjecting the latter to pressure; melting it in water, so that the impurities may subside; and allowing the wax to cool in moulds. This constitutes

CERA FLAVA, YELLOW WAX, which has a grayish-yellow colour; a peculiar and rather agreeable odour; scarcely any taste; considerable firmness and tenacity, but no greasiness to the touch. It is apt, however, to be adulterated by suet, which gives it a fatty feel and a disagreeable taste. Adulteration with resin is recognised by its solubility in cold alcohol; and with bean meal or pea meal, starch or any other amylaceous matters, by its insolubility in oil of turpentine.

The druggists of this city, (Philadelphia,) are supplied chiefly from the Western states and North Carolina,—especially the latter,—and from Cuba. Some of an inferior quality is imported from Africa, (Wood and Bache).

CERA ALBA, WHITE WAX, is prepared by exposing yellow wax, in thin layers or ribands, to air, sunshine and moisture, and thus bleaching it; by which process it loses also, in a great measure, its odour. As met with in the shops, it is of a white or yellowish-white colour;—the whitest varieties having spermaceti mixed with them, which is added by the dealers to improve its colour. It is generally in circular cakes; solid; brittle; devoid of smell, or nearly so; and tasteless.

Dr. Christison describes two commercial varieties—one called *German wax*, and imported into Great Britain from Hamburg. It is rather yellower, somewhat more translucent, harder, and less easily fusible than the English wax, or that which is prepared in Britain. The German variety is said to be the more esteemed of the two, especially by dentists and others for moulding, on account of its superior hardness. The greater softness of the English wax appears to be owing to the addition of spermaceti and fatty matters to increase its whiteness. (Christison.)

Wax is insoluble in water, cold alcohol and ether; but dissolves in about twenty parts of ether at the boiling temperature. It is readily soluble in the fixed and volatile oils; and combines, by fusion, with fats and resins, so as to form several most valuable topical applications.

It is now almost wholly used for the formation of cerates, ointments and plasters, with the view of giving them tenacity and consistence; but it has been prescribed as a demulcent in diarrhœa and dysentery. It may be melted with olive or almond oil, and when in the melted state may be rubbed up with yolk of egg or mucilage, so as to form an emulsion; but it is scarcely ever given at the present day.

MYRTLE WAX.—A vegetable wax is obtained from *Myrica cerifera*, a plant belonging to NAT. ORD. Myricææ, which is found in almost all parts of the United States. The fruit is coated with wax, which is separated by boiling the berries in water, and skimming off and straining the melted wax that floats on the surface;—or, it is allowed to concrete as the fluid cools, and is removed in the solid state. To purify it, it is remelted and strained, and cast into large cakes.

It is collected in New Jersey, but more copiously in the New England states, especially in Rhode Island, from which it is sent to other parts of the country.

Myrtle wax is of a pale grayish-green colour, and is more brittle and unctuous to the feel than beeswax; it has a feeble odour and bitterish taste; and, in its chemical relations, bears a close resemblance to beeswax.

This variety of wax has been prescribed in dysentery; a tea-spoonful of the powder being mixed with mucilage or syrup, and given repeatedly through the day.

b. *External Demulcents.—Emollients.*

29. ADEPS.—LARD.

Lard, in the Pharmacopœia of the United States, is the prepared fat of *Sus scrofa*, the *hog*, free from saline matter. The fat of the omentum, mesentery and loins is generally selected for medical use. To separate it from the membranes in which it is contained, or—to render it, as it is sometimes termed—it is melted over a slow fire; strained through linen or flannel, and is often poured, whilst liquid, into a bladder, where it solidifies on cooling. Salt is sometimes added to preserve it; but this has to be separated from it to adapt it for medical use. It may be freed from the salt, by melting it in boiling water.

The sensible properties of lard are so well known as not to require description. It ought to have little taste or smell. It is insoluble in water; sparingly soluble in alcohol, but more so in ether and the volatile oils. When melted, it dissolves wax and resin; and is, therefore, much used in the formation of ointments. It is composed of three

neutral fatty principles, *stearin*, *margarin*, and *olein*; the first of which is the concrete principle. Recently, *lard oil* has been made from it.

Its chief use is pharmaceutical—as a constituent of cerates and ointments. It is sometimes, however, employed as an emollient—for example, rubbed on the perinæum in cases of parturition, with the view of relaxing it; or over the affected muscles when they are rigid, as in cases of *contractura*. In eleemosynary institutions, it is often used as a substitute for simple or spermaceti ointment to dress blisters; but owing to its containing salt, and being rancid, it is said to have occasioned irritation and ulceration. It is added, at times, to laxative and emollient enemata, under the same circumstances as fixed vegetable oils; and, like the different pomatums, is used by the accoucheur to smear the finger, on making his examinations *per vaginam*, and by the surgeon for the same purpose in examining the rectum, as well as to smear his instruments.

CERATUM SIMPLEX, SIMPLE CERATE. (*Adipis* ℥viij; *Ceræ albæ* ℥iv.) This is a common emollient dressing to blisters and ulcers, where it is desirable to preserve them moist and free from the contact of air, and of extraneous bodies floating in it.

UNGUENTUM SIMPLEX, SIMPLE OINTMENT. (*Ceræ albæ* ℥ij; *Adipis* ℥iv.) Employed in the same cases as the last.

30. OLEUM AMYGDALÆ.—OIL OF ALMONDS.

The general properties of almond oil have been given elsewhere, (Vol. i. p. 168,) as well as those of OLIVE OIL, (Vol. i. p. 168,) which are analogous. It is a frequent addition to enemata—emollient and laxative; and a common constituent of plasters, cerates, ointments and liniments. It is sometimes rubbed on the skin with the view of relaxing parts; and is applied to inflamed surfaces, to sheathe them from the irritating influence of the air, and extraneous bodies. It has been recommended to smear it over the body as a protection against plague; but it is not probable that it is of any efficacy; as there is little reason for believing that the morbid impression is made through the skin. In surgery and obstetrics, it is used, like lard, to smear fingers or instruments that have to be introduced into outlets.

UNGUENTUM AQUÆ ROSÆ, OINTMENT OF ROSEWATER. (*Aquæ rosæ*, *Ol. amygdal.* āā f.℥ij; *Cetacei* ℥ss; *Ceræ albæ* ℥i.) This ointment is sold as *cold cream*, and is much used as a *lip salve*, and as an application to chapped and excoriated surfaces.

31. CETACEUM.—SPERMACETI.

Spermaceti, (Vol. i. p. 246,) like fixed oils, is an ingredient of cerates and ointments, which are employed as emollients.

CERATUM CETACEI, SPERMACETI CERATE. (*Cetacei* ℥j; *Ceræ albæ* ℥iij;

Ol. oliv. f. 3vj.) This cerate is a common and mild emollient dressing for blisters, and for simple sores.

32. LINUM.—FLAXSEED.

Linseed or flaxseed meal, formed either from the ground seed of *Linum usitatissimum*, or from the oil cake, which remains after the expression of linseed oil, ground to powder, (Vol. i. p. 249,) is much employed as an emollient poultice. It requires but to be mixed with boiling water until it has the proper consistence. The meal, obtained from oil cake, is preferred by many to the ground seeds, on account of the latter being more apt to become rancid. Others, however, assign a preference to the former.

OLEUM LINI, FLAXSEED OIL, is the oil of the seed expressed sometimes with heat; at others without,—or *cold drawn*: at others, again, the seeds are roasted before being subjected to pressure, with the view of destroying the gummy matter contained in their exterior coating. (Wood and Bache.) Where heat is applied, the oil is less bland; but it would appear to become sooner rancid than oil expressed at a steam heat of about 200 degrees. From eighteen to twenty pounds of oil, according to Mr. Brande, are obtained by cold expression from one hundred weight of the bruised seed. As usually met with in the shops, it is of a yellowish-brown colour, but it may be rendered quite colourless; it has a peculiar smell and taste; is soluble in 40 parts of cold alcohol, in 5 of boiling alcohol, and in about $1\frac{1}{2}$ of ether. Exposed to the air, it thickens, and gradually dries into a varnish, which gives occasion to many useful applications in the arts. The drying property is much increased, either by boiling it alone, or with litharge, or sugar of lead, or common white vitrol; when it is called *drying oil* or *boiled oil*, and is much used by painters. It readily becomes rancid.

Linseed oil possesses no virtues as an emollient over olive oil and almond oil; nor is it often substituted for them, except in burns, in which it has acquired an accidental reputation, either applied alone or in conjunction with lime-water, as in **LINIMENTUM CALCIS** of the Pharmacopœia of the United States. (Vol. ii. p. 149). This liniment acts by keeping the parts in a soft state, through the emollient properties of the *soap*, which the liniment really is; and chiefly, perhaps, by defending the burnt surfaces from the desiccative and irritating influence of the air,—the liniment filling up the areolæ of the rag on which it is applied, and completely protecting the inflamed parts, in the same manner as if so much raw cotton had been placed over them.

33. SESAMUM.—BENNE.

The leaves of benne are sometimes used in the formation of emollient cataplasms.

OLEUM SESAMI, Benne oil—obtained by expression from the seeds—

(Vol. i. p. 251,) possesses the general properties of olive oil, and may be used as an emollient in the same cases. It does not readily turn rancid.

34. TRITICI FARINA.—WHEAT FLOUR.

Bread—made of wheaten flour—boiled in milk, forms the common *bread and milk poultice*; to this a little lard or oil is generally added to prevent its adhering to the surface to which it is applied. It is much used to promote suppuration, and as an emollient application to irritable ulcers. Bread is also employed alone, at times, as a vehicle for other applications; for example, moistened with lead water, and placed within gauze as an application in ophthalmia and other local inflammations.

A decoction or infusion of *bran* is sometimes used as an emollient pediluvium; and internally as a demulcent in catarrhal affections especially.

In many parts of the United States, a common emollient cataplasm is made of Indian meal—the farina of *Zea mays*—boiled with water (*mush*,) or milk.

35. AVENÆ FARINA.—OATMEAL.

Oatmeal (Vol. ii. p. 390,) is frequently used as a poultice, in countries where it is more eaten as food than it is in the United States. It forms, when boiled with water, a good emollient poultice; and, with linseed oil cake, the *Pulvis pro cataplasmate* of the Dublin Pharmacopœia.

36. ULMUS.—SLIPPERY ELM BARK.

This bark (Vol. i. p. 252,) is sometimes employed as an emollient application in external inflammation;—the powder being made into a poultice with hot water; or the bark itself is applied, after having been previously softened by boiling.

37. OLEUM BU'ULUM.—NEATS' FOOT OIL.

Neats' foot oil is officinal in the Pharmacopœia of the United States only. It is prepared from the bones of *Bos domesticus*, the *ox*; by boiling the feet of the animal, deprived of the hoof, for a long time in water; skimming the fat and oil from the surface, and putting them into water heated to the boiling point. "The impurities having subsided, the oil is drawn off, and, if required to be very pure, is again introduced into water, which is kept for twenty-four hours sufficiently warm to enable the fat which is mixed with the oil to separate from it. The liquid being then allowed to cool, the fat concretes, and the oil is removed, and strained or filtered through layers of small fragments of charcoal free from powder." (Wood and Bache.)

This oil congeals with difficulty; and has been introduced into the

Pharmacopœia of the United States as an ingredient in *Unguentum hydragryi nitratis*. (Vol. ii. p. 303.)

38. GLYCERINA.—GLYCERIN.

Glycerin, hydrated oxide of glyceryl, forms the base to the stearic, margaric, and oleic acids of fat oils and tallow, and is separated when these acids are made to combine with an alkali or any metallic oxide in the saponification of the oils. It is obtained by heating together olive or other suitable oil, oxide of lead, and water, as in the manufacture of common lead plaster: an insoluble salt of lead, is formed, and glycerin remains in the aqueous fluid. This is treated with sulphohydric acid; digested with animal charcoal; filtered, and evaporated *in vacuo* at the temperature of the air.

In a pure state, it forms a nearly colourless and very viscid liquid, of the specific gravity 1.27; has an intensely sweet taste, and mixes with water and alcohol in all proportions; but is insoluble in ether.

Glycerin has been introduced, within the last few years, as a remedy for the cure of certain cutaneous diseases. It resists evaporation when exposed to an elevated temperature. Mr. Startin, indeed, who first recommended it, affirms, that a common plate, wetted with it, may be kept in an oven, side by side with a joint of meat, until the meat is cooked, without any sensible diminution occurring in the quantity of the liquid. Hence, when applied to the skin, it remains moist, forming a coating or varnish, which is not distinguishable from the ordinary secretion of the part. A lotion, composed of half an ounce to ten fluid-ounces of water, effectually prevents the skin from becoming dry; when employed in its pure state, it makes the part stiff and uncomfortable; and consequently answers best when diluted. It is also added with advantage to poultices, and even to baths. Mr. Startin speaks of its use chiefly in psoriasis, pityriasis, lepra and ichthyosis; in all which diseases he describes it as producing excellent palliative effects. In a case of porrigo, it produced excellent effects in the hands of the author, after the ordinary topical applications had failed, and he has used it with good results in psoriasis and other cutaneous affections, in which there was erythema of the skin.

It is probable, that glycerin might be used with much advantage in burns, and erysipelas,—whenever, indeed, it is desirable to prevent the desiccative influence of the air from irritating an exposed surface.

II. DILUENTS.

Necessity for drinks—Therapeutical use—Their absorption prevented by certain circumstances—Employment in dropsies, diseases of urinary organs, &c.

A SLIGHT observance of the habits and instincts of man sufficiently shows, that drinks or liquids are more imperiously demanded by him than solids. This is owing to the constant drain of fluid from the system by the various secretions—the pulmonary and cutaneous transpira-

tions, urine, &c.—and of the large proportion which the fluids composing the animal body bear to the solids.

The necessity for the ingestion of fluids is indicated by thirst,—an internal sensation, in its essence resembling hunger, although not referred to precisely the same organs. The desire, however, can be much modified by habit; for whilst some individuals require several gallons a day to satisfy their wants; others, who, by resistance, have acquired the habit of using very little liquid, enjoy good health; and do not experience the slightest inconvenience from its privation. This privation, it is obvious, cannot be absolute, or pushed beyond a certain extent. There must always be fluid enough taken to administer to the necessities of the system.

That the sensation of thirst is often greatly dependent upon the quantity of fluid circulating in the vessels is shown by the fact, mentioned by M. Dupuytren, that he succeeded in allaying the thirst of animals, by injecting milk, whey, water, and other fluids into the veins; and M. Orfila states, that, in his toxicological experiments, he frequently quenched, in this way, the excessive thirst of animals to which he had administered poison; and which were incapable of swallowing liquids, owing to the œsophagus having been tied. He found, also, that the blood of animals was more and more deprived of its watery portions, as abstinence from liquids was more prolonged.

Generally, however, the desire for liquid is, within certain limits, an artificial appetite; and, like the desire for solid food, is greatly regulated by the habits of the individual. So powerful, indeed, is the force of custom, that if a person were to habituate himself to take a glass of water every day at a certain hour, the desire would recur daily with all the force of a primitive instinct. Often, too, thirst is present in conditions of the system, where we have no reason to presume that there is a want of fluid, and where it is produced by morbid influences of a totally different character. It becomes, under such circumstances, a symptom of disease, and is one of the most prominent evidences of every kind of febrile and inflammatory indisposition; although, like each of the most marked symptoms of such indisposition, it may be occasionally wanting. The value of drinks, in such cases, is not dependent upon their action as diluents; and, consequently, in this point of view, they do not belong, in strictness, to this division of therapeutical agents. The thirst is owing to the excitement of the organic actions in the mucous membrane of the digestive tube; and the good effects of the fluid taken are dependent upon its possessing a temperature calculated to allay such excitement. Hence it is, that cold drinks are greedily sought after, and that warm do not furnish the same marked relief.

In this way, cold water or any cold drink acts as a refrigerant, and its *modus operandi* has accordingly been considered under another head. Water—the chief constituent of all drinks—is an essential component of every circulating fluid; and modern experiments have shown, that it penetrates most, if not all, animal tissues better than any other fluid; and, consequently, passes through them readily, to accumulate in any of its own solutions,—as the blood; but whenever there is a high de-

gree of exaltation of organic actions, or of hyperæmia in the mucous membrane of the alimentary canal, absorption is by no means readily effected; even the physical phenomenon of imbibition appears to be materially retarded. Hence—as previously shown—it is difficult to bring the system under the influence of mercury, in adynamic conditions, in which there is hyperæmia of the lining membrane of the intestines. The same remark has been made regarding the function of intestinal absorption in malignant cholera. Although attempts have been frequently made to affect the system with mercury; and, by administering saline solutions, to produce some change in the condition of the circulating fluid, it is doubtful, whether, during the violence of the disease, any absorption has been effected; and, in many cases, the agents would seem to have remained in the intestinal canal until the disease had become somewhat mitigated; after which, absorption was resumed, and their effects then became apparent. In other—and the generality of—instances they have passed through the bowels unchanged. A medical gentleman informed the author, that a practitioner was speaking to him, during the prevalence of cholera in 1832, of the very great extent to which he had given calomel in that disease. “Well,” said the gentleman, “and what became of this enormous quantity of the mercurial?” “Why, it passed through the bowels like so much corn-meal!” Now, it is not easy to see what could have been the salutary agency expected from large doses of a substance, which was visible in the evacuations in such quantity. The fact, however, demonstrates the truth of the remark just made,—that absorption is, in these cases, almost null; and that calomel, like other agents, may produce no effect upon the system, until some degree of recuperative energy has been awakened.

If, however, the passage of diluents into the blood-vessels be retarded by hyperæmia or a powerfully excited condition of the mucous membrane, it is largely facilitated by any circumstances that give occasion to a diminution in the quantity of the circulating fluid. On this, so much has been said under the head of EUTROPHICS, that it is not necessary to dwell upon it here. It may be remarked, however, that the deficiency of the serous portions of the blood in most cases of malignant cholera, and the consequent inspissation of the remainder, has suggested the injection of saline solutions into the blood-vessels; but the remedy has not answered the purpose. It diluted the blood, but did not remove the more important mischief,—the cause that gave occasion to the profuse separation of the fluid.

It has been a question of some importance, whether diluents ought to be freely allowed in cases of dropsy. Without repeating what was before said on the pathology of that affection, it may be remarked, that it would seem proper not to allow fluid too freely, unless as a vehicle for diuretics. Where increased exhalation occurs into any cavity, a corresponding diminution must take place in the mass of the circulating fluid; and if tenuous drinks be freely permitted, the amount may be speedily made up, and the dropsical accumulation favoured. It is, consequently, better to allow the patient for common drink a solution of bitartrate of potassa, which, when flavoured with lemon-peel, and sweetened, proves

a grateful diuretic drink ; and yet, as it is medicated, there is not so much danger of its being taken to an injurious extent.

Great difference—irrational difference—of sentiment has existed in regard to the proper quantity of drink or diluents most favourable to digestion. In strictness, this is a question of hygiene ; but it interests the dyspeptic therapeutically also. Where the salivary and other secretions are too sparing to communicate to solid food the due digestive texture, liquids, in proper quantity, favour the gastric operations ; but, if they be taken freely during a meal, the texture is rendered too soft ; and the gastric secretions are so much diluted, that digestion is more difficult. Hence it appears, that an error in quantity, at either extremity of the scale, should be avoided. In many places, it is the custom to hand round lemonade, wine, toddy, punch, &c., before dinner ; but the dyspeptic should carefully eschew them. With many, they cause acidity ; and before the individual sits down to his repast, the stomach is in a very unfit state for the reception of the various articles received into it at a fashionable dinner party.

Where acrid or poisonous substances have been swallowed, dilution is generally indicated ; but discrimination is here required. Some substances act more violently when in a state of solution, and hence *dry vomiting* is advisable to get rid of them ; or, if diluents be permitted, they must be removed again as speedily as possible by the stomach pump, or by one of the direct emetics ; but, where the poison is a simple acrid, no doubt can exist regarding the propriety of dilution, and we generally have recourse to agents belonging to the class last considered, which not only dilute the deleterious article, but shield the parts from its injurious contact.

In diseases of the urinary organs—especially such as are of an inflammatory nature—diluents are largely employed. The author has before remarked, that in such cases demulcents act as mere diluents ; but their use is universal. By weakening the saline compound, which constitutes the urine, diluents prevent the irritation that would otherwise be produced in the inflamed parts, during the passage of that fluid ; and hence they are much used in *ardor urinæ*, which term—as stated before—is appropriated to a symptom,—the disease consisting in an inflammatory state of the lining membrane of the urethra, on which the urine, although in a healthy condition, acts as an irritant.

SECTION IX.

OF DEOBSTRUENTS, ANTIDOTES, AND ANTIPARASITICS.

Deobstruents—Are indirect agents. Alteratives—Their *modus operandi*—Only used in chronic diseases. Antidotes—Definition of—Are of two kinds—Division of poisonous agents—Therapeutics of poisoning, internal and external—Table of poisons and their antidotes—Antiparasitics,

1. DEOBSTRUENTS.

SYNON. *Dephractica, Deoppilantia, Deoppilativa.*

WHEN the humoral pathology was universally in vogue, the deobstruent medication prevailed everywhere. It was believed, that, owing to altered consistence of the blood and humours, the small vessels might become obstructed; and that certain agents, by modifying the spissitude of the circulating fluid, might remove such obstruction; and be entitled to the appellation of DEOBSTRUENTS. It is clear, however, that all such remedies must be relative agents only. Obstructions in the capillary system of vessels must depend upon so many causes, that no exclusive plan of medication can be appropriate; and, accordingly, at the present day, the term 'deobstruent' is almost banished from medical language; and, when we meet with it, it is too often employed without any precise ideas being attached to it.

Formerly, it corresponded to the term 'aperient' in its *general*—not in its *restricted*—acceptation. Now, it is more commonly used conventionally,—to express the agent, whatever may be its nature, which renders parts pervious that may have been obstructed. To exhibit the indefinite manner in which it is employed by those who yet retain it, it is sufficient to refer to recent and valuable works on the *materia medica*; in which we are told that sulphate of potassa "is *deobstruent* and cathartic," and carbonate of soda "antacid and *deobstruent*." From what we know of the effect of alkalies in augmenting the tenuity of the blood, we might understand,—if that fluid were too viscid, and obstructions were caused by such viscosity,—that a deobstruent effect might be exerted by carbonate of soda; but even if we admit the possibility of such stasis of the fluid of the circulation in the capillary system of vessels, we have no means of detecting it; and we could not, consequently, pronounce when the remedy is indicated. It is well known, however, that obstructions are generally—if not always—induced by an excited action of the capillaries, which gives occasion to new depositions—to morbid formations, in other words—over which the agents in question can have but little control.

But if we admit the deobstruent agency of carbonate of soda, it is not so easy for us to understand how sulphate of soda can accomplish a similar result; or why this salt should be considered entitled to the merit of being a deobstruent more than any other of the class of saline agents; and it would not be an easy matter for those who ascribe such

action to sulphate of potassa to explain distinctly what they themselves mean by the term *deobstruent* as contradistinguished from *cathartic*.

The German writers, and some of the British, have a division of RESOLVENTS (*auf lö send e Mittel*), or LIQUEFACIENTS (*verfl ü ss ig end e Mittel*), which seem to have, in some respects, the signification of deobstruents. "We understand," say the Messrs. Schroff, "by resolvents (*auf lö send e Mittel*), those therapeutical agents, that act upon the plastic life of the human organism in such a manner, that they either moderate excessive formative impulse, (*Bildungstrieb*); or diminish the too firm consistence or cohesion of organic matters, and reduce them to the fluid condition." Under this head are reckoned mercurials, iodine, alkalies, and other agents, which modify the condition of the fluid, and, through it, that of the system of nutrition; and which have, therefore, been considered, in this work, under the head of EUTROPHICS.

II. ANTIDOTES.

SYNON. *Alexicaca, Alexipharmaca, Alexiteria, Theriaca, Counterpoisons.*

THE days of secret poisoning have passed away; and with them the use of alexipharmics, alexiterics, and theriacs, which encumbered the works on materia medica and pharmacy; and although it may be admitted, that a Toffania and a Brinvillier might prepare arsenical and other combinations of such a degree of strength, that, when regularly exhibited, they might ultimately exert a deleterious agency on the system, such cases, if they ever occur, must be looked upon as rare.

The term *antidote* is now employed in the sense of *counterpoison*. It means an agent, which has the power of counteracting, neutralizing, or destroying—more or less—the deleterious properties of poisonous substances, in the stomach or out of it. A modern toxicologist, (Christison,) divides them into two kinds; the one taking away the deleterious qualities of the poison, before it comes within the sphere of vital action, by altering its chemical nature; the other controlling the poisonous action after it has commenced, by exciting a contrary action in the system. The former are decidedly the most important in a therapeutical point of view. A reference to the table of poisons and their antidotes, given hereafter, will show that there are few agents which can be ranked under the latter.

Perhaps, all poisonous articles may admit of classification under the three heads of—IRRITANTS, NARCOTICS, and ACRO-NARCOTICS or NARCOTICO-ACRIDS. This is the division that has been employed by Dr. Christison, and by Dr. Beck in his valuable work on Medical Jurisprudence. These terms convey to the mind the main phenomena that may be expected from the individual agents belonging to the respective divisions, as well as their *modus operandi*. The *first*,—IRRITANTS—under which may be ranged the vegetable ACRIDS of the classifications of Fodéré and Orfila, as well as the CORROSIVES of the same toxicologists

—inflame the lining membrane of the digestive tube, and destroy by the violent action they excite in that expansion. Some of the class, however, act also on organs more remote; but still—as Dr. Christison has observed—the most prominent feature is the inflammation they excite wherever they are applied. The *second*—NARCOTICS—act but insignificantly on the part with which they are placed in contact. Their influence is exerted on the great nervous centres,—either through the impression they make on the nerves of the part,—on the nerves distributed to the lining membrane of the blood-vessels of the part, or through the agency of the circulation;—all which has been investigated under the section on narcotics;—and *lastly*, the ACRO-NARCOTICS or NARCOTICO-ACRIDS combine the agencies of the other two divisions. They are acrid and narcotic;—that is, they not only irritate and inflame the lining membrane of the first passages, but affect the great nervous centres injuriously—causing narcosis. Some of the most deadly poisons belong to this division of toxical agents.

It fortunately happens, that, therapeutically, the same mode of management is applicable, whatever may be the poisonous agent taken. The great object is to remove the poison as soon as possible,—by the stomach pump, if it be at hand; and, if not, by mechanical irritants applied to the fauces, or by one of the direct emetics; and here we have to bear in mind the remark, made under DILUENTS, that if the poisonous agent be soluble, dry vomiting should be induced; for if a large quantity of fluid be allowed, and it be not removed from the stomach on the instant, the deleterious effects of the poison may be exerted with more energy than if fluid had been denied. When the stomach-pump is at hand, the organ can be well washed out, without the fluid remaining long enough to admit of the solution of the poison, and its subsequent absorption.

The removal of the poison is the object, then, of primary moment; but, along with this, or subsequently, agents should be employed, which are known to modify the chemical condition of the poison, by rendering it insoluble or nearly so,—not only in water, but in the gastric secretions. Such are '*true antidotes*,' and alone to be trusted to. "It is chiefly," says Dr. Christison, "among the changes induced by chemical affinities, that the practitioner must look for counter-poisons; and the ingenuity of the toxicologist has thence supplied the materia medica with many of singular efficacy. When given in time, magnesia or chalk is a complete antidote for the mineral acids, and oxalic acid; albumen for corrosive sublimate and verdigris; bark for tartar emetic; common salt for lunar caustic; sulphate of soda or magnesia for sugar of lead and muriate of baryta; chloride of lime or soda for liver of sulphur; vinegar or oil for the fixed alkalies; and these substances act either by neutralizing the corrosive power of the poison, or by forming with it an insoluble compound."

It need scarcely be said, that any therapeutical agents, which add to the activity of absorption, must be improper whilst a soluble poison is in the stomach, or is applied to any solution of continuity on the surface of the body. Blood-letting, being one of the most energetic sorbent-facients, ought to be carefully avoided; except where the poison is a

purely local irritant. In cases of external poisoning, a cupping-glass is applied to the wound, or a ligature put round the limb, above the seat of injury,—on similar principles. The cupping-glass not only prevents absorption, but draws the blood from the wound, and with it the poison.

Lastly:—The practitioner may have to attend to the effects of the poison upon the functions, and to remove morbid phenomena that may have been induced by it. These have to be treated on general principles. In the state of exhaustion, occasioned by hydrocyanic acid, diffusive stimulants are given: in narcosis, induced by opium, the cold *douche* may be needed; and, where inflammatory symptoms appear, after the poison has been removed from the stomach, blood-letting and the whole class of antiphlogistics may be demanded.

The following Table was prepared for the first edition of the *General Therapeutics*, at the author's request, by Dr. Wm. R. Fisher,—at the time a resident of Baltimore,—a gentleman whose scientific attainments were ample, and whose attention had been zealously and usefully directed to the chemical and other relations of Toxicology; some of the results of which are contained in the pages of the "*American Journal of Pharmacy*." Soon afterwards, he was appointed Professor of Chemistry in the University of Maryland; and subsequently in the College of Pharmacy of Philadelphia; which situation he resigned in order to commence the study of divinity preparatory to taking holy orders. Desirous of affording Dr. Fisher an opportunity for revising the table, the author corresponded with him on the subject; and a few days after he received what proved to be Dr. Fisher's last suggestions, the author had the regret to learn, that an attack of apoplexy had terminated his brief but useful career.

TABLE OF POISONS AND THEIR ANTIDOTES.

CLASS FIRST.—INORGANIC POISONS.

- | | | |
|---|--|---|
| <ol style="list-style-type: none"> 1. Acids. 2. Alkalies and their compounds. 3. Bromine. 4. Earths and their compounds. 5. Empyreumatic Oils. 6. Ethers. | | <ol style="list-style-type: none"> 7. Gases. 8. Glass or Enamel, pounded. 9. Iodine. 10. Metals and their compounds. 11. Phosphorus. 12. Vapours. |
|---|--|---|

CLASS SECOND.—ORGANIC POISONS.

A. VEGETABLE.

1. Acro-Narcotics.
2. Irritants.
3. Narcotics.
4. Proximate Principles of Vegetables.

B. ANIMAL.

1. By change in constitution, or disease.
2. Fishes.
3. Insects.
4. Serpents.

CLASS I.—INORGANIC POISONS.

I. ACIDS.

POISONS.	ANTIDOTES.
† Acidum Aceticum. <i>Acetic Acid.</i>	Magnesia. Carbonate of Magnesia.
† Acidum Arsenicum. <i>Arsenic Acid.</i>	
† Acidum Arseniosum. <i>Arsenious Acid.</i>	Hydrated oxide of Iron.
† Acidum Botulinicum. <i>Botulinic Acid.</i> See <i>Sausage Poison.</i>	
Acidum Carbonicum. <i>Carbonic Acid.</i> See <i>Gases.</i>	
† Acidum Chlorohydricum. <i>Chlorohydric Acid.</i>	Carbonate of Soda.
† Acidum Citricum. <i>Citric Acid.</i>	Carbonate of Potassa. Carbonate of Lime.
Acidum Hydrocyanicum. <i>Hydrocyanic Acid.</i>	Ammonia. Chlorine, (liquid.)
† Acidum Muriaticum. <i>Muriatic Acid.</i>	See Acidum Chlorohydricum.
† Acidum Nitricum. <i>Nitric Acid.</i>	Carbonate of Lime. Magnesia. Carbonate of Magnesia.
† Acidum Oxalicum. <i>Oxalic Acid.</i>	Lime Water. Magnesia.
† Acidum Phosphoricum. <i>Phosphoric Acid.</i>	Carbonate of Lime.
Acidum Prussicum. <i>Prussic Acid.</i>	See Acidum Hydrocyanicum.
† Acidum Sulphuricum. <i>Sulphuric Acid.</i>	Magnesia. Carbonate of Magnesia. Carbonate of Lime.
Acidum Sulphurosum. <i>Sulphurous Acid.</i> See <i>Gases.</i>	
† Acidum Tartaricum. <i>Tartaric Acid.</i>	Carbonate of Lime—Carbonate of Potassa.

II. ALKALIES AND THEIR COMPOUNDS.

† Ammonia Liquor. <i>Solution of Ammonia.</i>	Fixed Oils. Vinegar. Lemon Juice.
† Ammonia Arsenias. <i>Arseniate of Ammonia.</i>	
† Ammonia Arsenis. <i>Arsenite of Ammonia.</i>	
† Ammonia Murias. <i>Muriate of Ammonia.</i>	
† Potassa. <i>Caustic Potassa.</i>	Fixed Oils. Vinegar. Lemon Juice.
† Potassa Arsenias. <i>Arseniate of Potassa.</i>	
† Potassa Arsenis. <i>Arsenite of Potassa.</i>	Carbonate of Potassa. Carbonate of Soda.
† Potassa Bichromas. <i>Bichromate of Potassa.</i>	
† Potassa Carbonas. <i>Carbonate of Potassa.</i>	Lemon Juice. Vinegar.
† Potassa Hydrobromas. <i>Hydrobromate of Potassa.</i>	
† Potassa Hydriodas. <i>Hydriodate of Potassa.</i>	
† Potassa Nitras. <i>Nitrate of Potassa.</i>	Chloride of Sodium. Chlorinated Soda.
† Potassii Sulphuretum. <i>Sulphuret of Potassium.</i>	
† Soda. <i>Caustic Soda.</i>	Fixed Oils. Vinegar. Lemon Juice.

N. B. Irritant poisons are marked thus.† Indigenous plants.* Exotic plants introduced into this country.‡

Where no antidote is placed opposite an article, it means, that there is no established antidote for it.

III. BROMINUM.

POISONS.

ANTIDOTES.

Bromine.† Potassii Bromidum. *Bromide of Potassium.*

IV. EARTHS AND THEIR COMPOUNDS.

† Barii Chloridum. *Chloride of Barium.*
 † Baryta. *Barytes.*
 † Barytæ Carbonas. *Carbonate of Baryta.*
 † Barytæ Nitras. *Nitrate of Baryta.*
 Calx. *Quicklime.*

Sulphate of Magnesia. Sulphate of Soda.
 Dilute Sulphuric Acid.
 Dilute Sulphuric Acid.
 Sulphate of Magnesia. Sulphate of Soda.
 Mineral or Soda Water (artificial) ? Effer-
 vescing draught ?

V. EMPYREUMATIC OILS.

*Creasote.**Albumen ?*Oleum Adipis Empyreumaticum. *Empyreumatic Oil from Lard.*Oleum Cornu Cervi Empyreumaticum. *Oil of Hartshorn—Dippel's Animal Oil.*Oleum Picis Liquidæ. *Oil of Tar.*Oleum Tabaci Empyreumaticum. *Empyreumatic Oil of Tobacco.*Oleum Terebinthinæ. *Oil of Turpentine.**Fusel Oil.*

Fixed Oils. Vinegar. Lemon Juice.

VI. ETHERS.

Æther Nitricum. *Nitric Ether.*Æther Sulphuricum. *Sulphuric Ether.*

VII. GASES.

† Ammoniacal.

† Arseniuretted Hydrogen.

Carbonic Acid.

Carburetted Hydrogen.

† Chlorine.

† Muriatic or Chlorohydric Acid.

† Nitric Oxide.

† Nitrous Acid.

† Oxygen.

Sulphuretted Hydrogen.

† Sulphurous Acid.

Inhalation of Ammonia or Ether.

Inhalation of Ammonia *cautiously.*Inhalation of Ammonia *cautiously.*Inhalation of Chlorine *cautiously.*Inhalation of Ammonia *cautiously.*

VIII. †GLASS, OR ENAMEL, POUNDED.

†IX. IODINUM.

Iodine.† Potassii Iodidum, Potassæ Hydriodas
Iodide of Potassium, Hydriodate of Potassa.

Gluten. Wheat Flour. Starch.

X. METALS AND THEIR COMPOUNDS.

POISONS.	ANTIDOTES.
Antimonium. <i>Antimony.</i>	
† Antimonii Chloridum, A. Murias. <i>Chloride of Antimony, Muriate of Antimony.</i>	Astringent Infusions.
† Antimonii Oxidum. <i>Oxide of Antimony.</i>	Astringent Infusions.
† Antimonii et Potassæ Tartras. <i>Tartrate of Antimony and Potassa.</i>	Astringent Infusions and Decoctions.
† Antimonii Vitrum. <i>Glass of Antimony.</i>	
Argentum. <i>Silver</i>	
† Argenti Nitras. <i>Nitrate of Silver.</i>	Chloride of Sodium.
† Arsenicum. <i>Arsenic.</i>	(See Acidum Arseniosum.)
† Arsenias Ammonia. <i>Arseniate of Ammonia.</i>	
† Arsenias Potassæ. <i>Arseniate of Potassa.</i>	
† Arsenias Sodæ. <i>Arseniate of Soda.</i>	
† Arsenis Ammonia. <i>Arsenite of Ammonia.</i>	
† Arsenis Cupri. <i>Arsenite of Copper.</i>	
† Arsenis Potassæ. <i>Arsenite of Potassa.</i>	
† Arsenici Oxidum Album. <i>White Oxide of Arsenic.</i>	(See Acidum Arseniosum.)
† Arsenici Oxidum Nigrum. <i>Black Oxide of Arsenic.</i>	
† Arsenici Sulphuretum Flavum. <i>Yellow Sulphuret of Arsenic.</i>	
† Arsenici Sulphuretum Rubrum. <i>Red Sulphuret of Arsenic.</i>	
Aurum. <i>Gold.</i>	
† Auri Nitro-Murias. <i>Nitro Muriate of Gold.</i>	Sulphate of Iron.
Bismuthum. <i>Bismuth.</i>	
† Bismuthi Subnitratis. <i>Subnitrate of Bismuth.</i>	Milk—Mucilaginous Drinks.
Chromium. <i>Chrome.</i>	
† Bichromas Potassæ. <i>Bichromate of Potassa.</i>	Carbonate of Potassa—Carbonate of Soda.
Cuprum. <i>Copper.</i>	
† Cupri Acetas. <i>Acetate of Copper.</i>	Albumen—Sugar—Iron.
† Cupri Arsenis. <i>Arsenite of Copper.</i>	Hydrated Oxide of Iron.
† Cupri Carbonas. <i>Carbonate of Copper.</i>	Albumen—Iron.
† Cupri Oxidum. <i>Oxide of Copper.</i>	Albumen—Iron.
† Cupri Sulphas. <i>Sulphate of Copper.</i>	Albumen—Iron.
Ferrum. <i>Iron.</i>	
† Ferri Chloridum. <i>Chloride of Iron.</i>	Carbonate of Soda.
† Ferri Sulphas. <i>Sulphate of Iron.</i>	Carbonate of Soda.
Hydrargyrum. <i>Mercury.</i>	
† Hydrargyri Chloridum Corrosivum. <i>Corrosive Chloride of Mercury.</i>	Albumen—Gluten—Gold finely divided in dust, with fine iron filings.
† Hydrargyri Cyanuretum. <i>Cyanuret of Mercury.</i>	
† Hydrargyri Nitras. <i>Nitrate of Mercury.</i>	
† Hydrargyri Oxidum Rubrum. <i>Red Oxide of Mercury.</i>	
† Hydrargyri Sulphas Flavus. <i>Yellow Sulphate of Mercury.</i>	
† Hydrargyrum Ammoniatum. <i>Ammoniated Mercury.</i>	

POISONS.

ANTIDOTES.

Osmium. <i>Osmium.</i>	
† Osmii Chloridum. <i>Chloride of Osmium.</i>	
† Palladium. <i>Palladium.</i>	
† Palladii Chloridum. <i>Chloride of Palladium.</i>	
Platinum. <i>Platina.</i>	
† Platini Chloridum. <i>Chloride of Platina.</i>	Muriate of Ammonia.
Plumbum. <i>Lead.</i>	
† Plumbi Acetas. <i>Acetate of Lead.</i>	Sulphate of Magnesia—Sulphate of Soda— Phosphate of Soda.
† Plumbi Carbonas. <i>Carbonate of Lead.</i>	Dilute Sulphuric Acid?
† Plumbi Oxidum Rubrum. <i>Red Oxide of Lead.</i>	
† Plumbi Oxidum Semivitreum. <i>Semivitrified Oxide of Lead.</i>	
Stannum. <i>Tin.</i>	
† Stanni Chloridum. <i>Chloride of Tin.</i>	Milk.
Zincum. <i>Zinc.</i>	
† Zinci Chloridum. <i>Chloride of Zinc.</i>	
† Zinci Oxidum. <i>Oxide of Zinc.</i>	
† Zinci Sulphas. <i>Sulphate of Zinc.</i>	Carbonate of Magnesia—Carbonate of Soda.

† XI. PHOSPHORUS.

Copious draughts containing Magnesia.

XII. VAPOURS.

† Antimonial.
 † Arsenical.
 † Bromine.
 † Iodine.
 Lead.
 Mercurial.

CLASS II. — ORGANIC POISONS.

A. VEGETABLE.

I. ACRO-NARCOTICS.

* <i>Æthusa Cynapium.</i> <i>Common Fool's Parsley.</i>	Bromine—Chlorine—Iodine. §
* <i>Aconitum Napellus.</i> <i>Monkshood.</i>	Bromine—Chlorine—Iodine.
* <i>Agaricus</i> , 5 species. <i>Mushrooms (poisonous.)</i>	
* <i>Amanita Muscaria.</i> <i>Truffles (poisonous.)</i>	
* <i>Anagallis Arvensis.</i> <i>Meadow Pimpernell.</i>	
<i>Anda Gomesii.</i>	
* <i>Apocynum Androsæmifolium.</i> <i>Dogbane.</i>	
* <i>Aristolochia Clematidis.</i> <i>Birthwort.</i>	
<i>Arnica Montana.</i> <i>Leopard's Bane.</i>	
* <i>Asclepias Syriaca.</i> <i>Swallowwort.</i>	
† <i>Atropa Belladonna.</i> <i>Deadly Nightshade.</i>	Bromine—Chlorine—Iodine.
* <i>Æsculus Ohioensis.</i> <i>Buckeye.</i>	
<i>Brucea Antidysenterica.</i> <i>False Angustura Bark.</i>	Bromine—Iodine.

§ Bromine, Chlorine and Iodine are said to be antidotes to the alkaloids generally, and they are therefore affixed to all those plants which are known to contain such a principle.

POISONS.

Cerbera, 3 species. *Cerbera*.
 Chærophyllum Sylvestre. *Bastard Hemlock*.
 Chaillotia Toxicana. *Ratbane*.
 • Chenopodium Murale. *Wormseed*.
 • Cicuta Maculata. *American Hemlock*.
 † Cicuta Virosa. *Water Hemlock*.
 Cissus. *Cissus*.
 Cocculus Indicus. *Fish berries*.
 Colchicum Autumnale. *Meadow Saffron*.
 • Conium Maculatum. *Hemlock*.
 Coriaria Myrtifolia. *Myrtle-leaved Sumach*.
 Curare. *Indian War Poison*.
 Cynanchum Erectum. *Cynanchum*.
 Cytisus Laburnum. *Laburnum*.
 • Datura Stramonium. *Thorn Apple*.
 † Digitalis Purpurea. *Foxglove*.
 Ergot. See Secale.
 • Ervum Ervilia. *Bitter Vetch*.
 • Gaultheria Procumbens. *Wintergreen*,
 (oil of.)
 Hæmanthus Toxicarius.
 Helleborus Niger. *Black Hellebore*.
 Hypophyllum Sanguinaria. *Puddock Stool*.
 Ipecacuanha. *Ipecacuanha*.
 Lathyrus Cicera. *Lathyrus*.
 Laurus Camphora. *Camphor*.
 • Lobelia Inflata. *Indian Tobacco*.
 • Lolium Temulentum. *Darnel*.
 • Melia Azederach. *Pride of China*.
 Mercurialis Perennis. *Mountain Mercury*.
 Nerum Oleander. *Common Oleander*.
 • Oenanthe Crocata. *Hemlock Dropwort*.
 • Nicotiana Tabacum. *Tobacco*.
 • Passiflora Quadrangularis. *Barbadine*.
 Piscidia Erythrina. *Jamaica Dogwood*.
 Polygala Venenosa (of Java.)
 • Rhus Radicans. *Poison Vine*.
 † Rhus Toxicodendron. *Poison Oak* or
Sumach.
 • Robinia Pseudo-acacia. *Locust Tree*.
 • Ruta Graveolens. *Rue*.
 • Sanguinaria Canadensis. *Blood Root*.
 Scilla Maritima. *Squill*. *Sea Onion*.
 † Secale Cornutum. *Ergot*, *Spurred Rye*.
 • Sium Latifolium. *Procumbent Water-*
Parsnip.
 • Spigelia Marilandica. *Pink Root*.
 Strychnos Ignatii. *St. Ignatius's Bean*.
 Strychnos Nux Vomica. *Nux Vomica*.
 • Symplocarpus Fœtida. *Skunk Cabbage*.
 Ticunas. *Extract of Various Plants of S.*
America.
 Tieuté. *Upas tieuté tree* (of Java.)
 † Triticum Hybernium. *Wheat (diseased)*.
 Upas Antiar. *Tree in Java*.
 Veratrum Album. *White Hellebore*.
 • Veratrum Viride. *American Hellebore*.
 Woorara. *War Poison of Guiana*.
 • Zea Mays. *Maize (diseased)*.

ANTIDOTES.

Bromine—Chlorine—Iodine.

Bromine—Chlorine—Iodine.

Bromine—Chlorine—Iodine.

Bromine—Chlorine—Iodine.

Common Salt—Sugar.

Bromine—Chlorine—Iodine.

Bromine—Chlorine—Iodine.

Infusion of Yellow Bark.

Bromine—Chlorine—Iodine.

Infusion of Galls.

Bromine—Chlorine—Iodine.

Bromine—Chlorine—Iodine.

Bromine—Chlorine—Iodine.

Bromine—Chlorine—Iodine.

Bromine—Chlorine—Iodine.

II. IRRITANTS.

POISONS.	ANTIDOTES.
* <i>Anemone Pulsatilla</i> . <i>Wind Flower</i> .	
* <i>Arum Maculatum</i> . <i>Wake Robin</i> .	
<i>Bryonia Dioica</i> . <i>Bryony</i> .	Bromine—Chlorine—Iodine.
* <i>Calladium Seguinum</i> . <i>Dumbcane</i> .	
* <i>Calla Palustris</i> . <i>Water Arum</i> .	
* <i>Caltha Palustris</i> . <i>Marsh Marigold</i> .	
† <i>Chelidonium Majus</i> . <i>Celandine</i> .	
* <i>Clematis Vitalba</i> . <i>Virgin Bower</i> .	
<i>Convolvulus Jalapa</i> . <i>Jalap</i> .	Bromine—Chlorine—Iodine.
<i>Copvolvulus Scammonia</i> . <i>Scammony</i> .	
<i>Croton Tiglium</i> . <i>Purging Croton</i> .	
† <i>Cucumis Colocynthis</i> . <i>Colocynth</i> .	Bromine—Chlorine—Iodine.
<i>Cyclamen Europæum</i> . <i>Sow Bread</i> .	
<i>Daphne Gnidium</i> . <i>Spurge Flax</i> .	
<i>Daphne Mezereum</i> . <i>Mezereon</i> .	
† <i>Delphinium Staphisagria</i> . <i>Stavesacre</i> .	Bromine—Chlorine—Iodine.
<i>Doica Palustris</i> . <i>Swamp leather wood</i> .	
* <i>Equisetum Hyemale</i> . <i>Scourgrass</i> .	
<i>Euphorbia Officinarum</i> . <i>Euphorbium Spurge</i> .	Bromine—Chlorine—Iodine.
* <i>Gratiola Officinalis</i> . <i>Hedge Hyssop</i> .	
<i>Hippomane Mancinella</i> . <i>Manchineel</i> .	
<i>Hura Crepitans</i> . <i>Sand Box</i> .	
* <i>Hydrocotyle Vulgaris</i> . <i>Marsh Pennywort</i> .	
<i>Jatropha Curcas</i> . <i>Indian Nut</i> .	
<i>Jatropha Manihot</i> . <i>Cassada</i> .	
* <i>Juniperus Sabina</i> . <i>Savin</i> (oil of.)	
* <i>Juniperus Virginiana</i> . <i>Red Cedar</i> (oil of.)	
<i>Momordica Elaterium</i> . <i>Squirting Cucumber</i> .	Bromine—Chlorine—Iodine.
† <i>Narcissus Pseudo-Narcissus</i> . <i>Daffodil</i> .	
<i>Pastinax Sativa</i> . <i>Common Parsnip</i> .	
* <i>Pedicularis Palustris</i> . <i>Marsh Lousewort</i> .	
* <i>Phytolacca Decandra</i> . <i>Poke</i> .	
<i>Piper Cubeba</i> . <i>Cubebs</i> .	
<i>Plumbago Europæa</i> . <i>Toothwort</i> .	Bromine—Chlorine—Iodine.
* <i>Ranunculus Acris</i> , and other species.	
<i>Crowfoot</i> .	
<i>Rhododendron Chrysanthemum</i> . <i>Oleander</i> .	
† <i>Ricinus Communis</i> . <i>Castor Oil Plant</i> .	
<i>Sambucus Ebulus</i> . <i>Elder</i> .	
† <i>Sedum Acre</i> . <i>Stone Crop</i> .	
<i>Stalagmitis Cambogioides</i> . <i>Gamboge</i> .	
† <i>Tanacetum Vulgare</i> . <i>Tansy</i> (oil of.)	

III. NARCOTICS.

* <i>Actæa Spicata</i> . <i>Baneberry</i> .	
<i>Amygdalus Communis</i> . <i>Bitter Almond</i> .	
† <i>Amygdalus Persica</i> . <i>Peach</i> .	
<i>Gelsemium Nitidum</i> . <i>Yellow Jessamine</i> .	
<i>Helonias Erythrosperma</i> . <i>Fly Poison</i> .	
<i>Hyoscyamus Albus</i> . <i>White Henbane</i> .	Bromine—Chlorine—Iodine.
* <i>Hyoscyamus Niger</i> . <i>Black Henbane</i> .	Bromine—Chlorine—Iodine.
* <i>Kalmia Latifolia</i> . <i>Mountain Ivy</i> .	
<i>Lactuca Virosa</i> . <i>Strong Scented Lettuce</i> .	
Opium, and proximate principles.	Infusion of Galls.

POISONS.

ANTIDOTES.

- † Papaver Somniferum. *Poppy*. See Opium.
- Paris Quadrifolia. *Herb Paris*.
- Prunus Caroliniana. *Wild Orange*.
- † Prunus Lauro-Cerasus. *Cherry Laurel*.
- Prunus Nigra. *Black Cherry*.
- † Prunus Padus. *Cluster Cherry*.
- Prunus Virginiana. *Wild Cherry*.
- Solanum Dulcamara. *Bitter Sweet*.
- Sorbus Acuparia. *Mountain Ash*.
- Taxus Baccata. *Yew*.

Bromine—Chlorine—Iodine.

IV. PROXIMATE PRINCIPLES OF VEGETABLES.

- Aconitia, see Aconitum.
- Atropia, see Atropa.
- Brucia, see Brucea.
- Codeia, see Opium.
- Colocynthin, see Cucumis.
- Daturia, see Datura.
- Delphina, see Delphinium.
- Elatin, see Momordica.
- Emetia, see Ipecacuanha.
- Hyoscyamia, see Hyoscyamus.
- Morphia, and Salts, see Opium.
- Narcotin, see Opium.
- Picrotoxin, see Coccus.
- Strychnia, see Strychnos.
- Veratria, see Colchicum.

B. ANIMAL.

I. BY CHANGE IN CONSTITUTION OR DISEASE.

- † Bacon.
- † Cheese.
- Crabs.
- † Eels.
- † Glanders, (infection from horses labouring under.)
- Mackerel.
- Milk.
- † Oily Matter from Kipper or dried Salmon.
- † Oysters.
- † Pustule Maligne, [flesh of animals labouring under.]
- Putrid Blood, Bile, or Brain.
- Saliva of the Rabid Dog.
- † Sausage Poison [bloody and white.]

II. FISHES.

- † Ballistes Monoceros. *Old Wife*.
- † Cancer Astacus. *Crawfish*.
- † Cancer Ruricolus. *Land Crab*.
- † Clupea Thyrssa. *Yellow Billed Sprat*.
- † Coracinus fuscus Major. *Grey Snapper*.
- † Coracinus Minor. *Hyne*.
- † Coryphæna Splendens. *Dolphin*.
- † Mormyra. *Blue Parrot Fish*.
- † Muræna Major. *Conger Eel*.
- † Mytilus Edulis. *Mussel*.
- † Ostracion Globellum. *Smooth Bottle-fish*.
- † Perca Major. *Barracuda*.

POISONS.

ANTIDOTES.

- † *Perca Venenata.* *Rockfish.*
- † *Perca Venenosa.* *Grooper.*
- † *Physalia.* *Portuguese Man of War.*
- † *Scomber Cæruleus.* *Spanish Mackerel.*
- † *Scomber Maximus.* *Kingfish.*
- † *Scomber Thynnus.* *Bonetta.*
- † *Sparus Chrysops.* *Porgie.*
- † *Tetrodon Ocellatus.* *Blower.*
- † *Tetrodon Sceleratus.* *Tunny.*

III. INSECTS.

- † *Apis Mellifica.* *Bee.* Solution of Ammonia.
- † *Cantharis Vesicatoria.* *Spanish Fly.*
- † *Culex Pipiens.* *Gnat.*
- † *Lytta Vittata.* *Potato Fly.*
- † *Æstrus Bovis.* *Gad Fly.*
- † *Scorpio.* *Scorpion.*
- † *Tarantula.* *Tarantula.*
- † *Vespa Crabro.* *Hornet.* Solution of Ammonia.
- † *Vespa Vulgaris.* *Wasp.* Solution of Ammonia.

IV. SERPENTS.

- † *Boa Crotaloides.* *Copperhead.*
- † *Cenchus Mockeson.* *Mockeson.*
- † *Coluber Berus.* *Viper.*
- † *Crotalus, (5 species.)* *Rattle snake.*
- † *Scytale Piscivorus.* *Water Viper.*

III. ANTIPARASITICS.

SYN. *Antiphthiriaca*.

ALMOST all animals and vegetables are subject to parasites ; and many are infested not only with parasitic animals, but parasitic plants. Recent researches favour the conclusion, that vegetable growths may be connected with certain diseased conditions of the cutaneous surface in man and animals ; and daily observation shows us, that plants are infested both with parasitic insects and vegetables.

Of late years, as before remarked, (Vol. ii. p. 328,) the idea has been revived, that scabies or common itch is owing to an insect burrowing in the skin, and exciting great irritation and itching ; and it has been conceived, that sulphur, veratrum, and the other remedies that may be employed for its cure, may act by destroying the “cutaneous vermination.”

In cases in which but few pediculi exist, the best antiparasitic is cleanliness. In our public eleemosynary institutions and prisons, the hair is cut short, and the new comer is sent to the bath, and well washed with soap and water. Attention of this kind, for a short period, is sufficient. In the present mode of wearing the hair, there is no difficulty in removing them ; but formerly, when it was plastered down daily by greasy applications, it was so common for parasites to make their nidus there, that the hair-dresser always added some antiparasitic, as the red oxide of mercury, to his pomatum to destroy them.

The best antiparasitic course is to brush the head daily ; and to use a fine-toothed comb.

SPECIAL ANTIPARASITICS.

THE antiparasitics of the materia medica, most commonly employed, are *red oxide of mercury*, which may be used either in the form of *Unguentum hydrargyri oxidi rubri*, of the Pharmacopœia, (Vol. ii. p. 296,) or mixed with ten or twenty parts of hair powder, a small quantity of which may be rubbed into the hair ;—*ammoniated mercury*, in the form of *Unguentum hydrargyri ammoniati*, or mixed with starch in the proportions just mentioned ;—*Unguentum hydrargyri* ;—or *Hydrargyri chloridum mite*, mixed with starch powder, which is regarded by some as the best antiparasitic in cases of *pediculus pubis*. *Unguentum veratri*, (Vol. ii. p. 395,) is used for the same purpose ; and, at times, a decoction of tobacco ; but the preparations above mentioned are less likely, when cautiously employed, to affect the system injuriously ; and are therefore preferred.

COC'ULUS.

Cocculus Indicus of the shops is the fruit of *Anamirta cocculus*, *Cocculus suberosus*, *Cocculus Indicus* plant; SEX. SYST. Diœcia Monadelphica; NAT. ORD. Menispermaceæ—a native of Malabar, and the eastern isles of India. The dried fruit is officinal in the Pharmacopœias of Edinburgh and Dublin. It resembles the bayberry, and consists externally of a thin, rugous, dark-coloured bitter coat, enveloping a thin bivalve shell or endocarp, within which is a whitish, oily, or bitter kernel, which does not fill the whole shell: this distinguishes it from the bayberry. (Pereira.) It was formerly brought from the Levant; and was, therefore, called *Coque du Levant*, *Levant shell*; but it is now imported altogether from India, chiefly for illegal purposes. Dr. Pereira states, that he found, from a druggist's private books, that in 1834, about 2500 bags were entered; and this, he thinks, was probably much below the quantity imported.

The poisonous principle of cocculus is a peculiar bitter matter called *picrotoxin*, which is very soluble in alcohol and ether, and may be separated by triturating the watery extract of the seeds with pure magnesia, and treating it with alcohol, which dissolves the picrotoxin: this may be obtained in an impure state by evaporation.

Cocculus is an acro-narcotic, and has long been known as a poison for taking fish, which it stupefies. It is, also, employed by fraudulent brewers, with the view of rendering beer more intoxicating, and at the same time bitter, without the employment of hops. In these cases, it is used in the form of extract; so that the fraud is not readily detected. As an antiparasitic to destroy pediculi, it is employed in the form of powder or of ointment. In India, it is applied in scabies; and Dr. Christison recommends it as one of the best applications in ringworm of the scalp. The Edinburgh Pharmacopœia has a formula for UNGUENTUM COCCULI, which is made as follows:—Take any convenient quantity of *Cocculus Indicus*; separate and preserve the kernels; beat them well in a mortar, first alone, and then with a little lard; and add lard till it amounts altogether to five times the weight of the kernels. It is used to destroy pediculi, and occasionally as a local application in obstinate chronic cutaneous diseases. In the same cases, an ointment of picrotoxin has been prescribed—*Picrotox.* gr. x; *Adipis* ʒj; but some caution is necessary, as the system may become affected both when the picrotoxin is used, and the cocculus itself.

STAPHISA'GRIA.—STAVES'ACRE.

Stavesacre is the seed of *Delphinium Staphisagria*, *stavesacre*; SEX. SYST. Polyandria Trigynia; NAT. ORD. Ranunculaceæ; a native of the south of Europe. The seed is about the size of a grain of wheat; of a somewhat triangular shape; rough, and of a dark brown colour externally; of a slight, but disagreeable odour; and of a bitter, acrid, hot and nauseous taste. Its main active principle has been separated

from it, and is termed *Delphinia* or *Delphinine*: it also contains a volatile oil, which in small doses is a powerful emetic.

Stavesacre is an active acro-narcotic; and, like cocculus, has been much used to destroy pediculi, which are readily killed by a wash made of an infusion of the bruised seeds in vinegar, or by an ointment of the powdered seeds well mixed with four or five times their weight of lard. An ointment might, also, be made of delphinia, and be used for the same purpose; but it is so virulent a poison as to require much caution in its employment. The preparations of delphinia have been used in the same cases as those of veratria.

SECTION X.

MINERAL WATERS.

WHEN we reflect on the multitude of persons who, during the proper seasons, frequent the mineral springs of this and other countries, it must be apparent, that although much good may result, in individual cases, from their employment in appropriate affections, a large amount of evil must result from their indiscriminate use in diseases for which they are not adapted: accordingly, every intelligent resident physician at fashionable watering places has deplored the ignorance of invalids and their medical advisers, which has doomed many a hopeless case to a most inconvenient pilgrimage; for although the accommodations at such places ought to be adapted expressly for the comfort of valetudinarians, attention appears to be paid rather to the healthy, who are able to enjoy the pleasures of the table; and to minister, therefore, more to the interests of the proprietors. Nothing, indeed, can be more forlorn than the condition of a sojourner at the best of these watering places, when his disease is beyond the resources of art; and when he is far from all those comforts, that home, and home alone can afford him. A weighty responsibility, consequently, rests on the medical adviser, who is unpardonable, if he has not previously made himself acquainted, as far as practicable, not only with the exact pathological condition of his patient, but with the remedial powers of the mineral waters; and the accommodations of the sanitarium to which he recommends him. In the large mass of cases, perhaps, in which he is consulted, the remedy that is clearly indicated is a thorough change of air and of all the circumstances that surround the invalid; but this is rarely a sufficient ultimate object with the patient; and it becomes important—in order to induce him to travel—to hold out prospects of advantage from a course to be pursued at the end of his journey.

In another work (*Human Health*, p. 125, Philad. 1844,) the author has dwelt upon the eminent advantages to health from simple change of air; and in the present volume he has taken occasion to refer to its value

as a revulsive and tonic agency in numerous diseases. To this, and to a change of diet and regimen, he has been disposed to ascribe much of that benefit which proverbially results from a journey, in the summer season, to any of the sites of our mineral springs. The multitudes of valetudinarians who annually leave their habitations to visit the watering-places of this country and of Europe, and who return to their homes in the enjoyment of health, and full of confidence in the virtues of the waters near which they have resided, but of which they may or may not have partaken, afford ample evidence of this beneficial agency. Long before the citizen of one of the Atlantic towns of this country reaches the Trans-Alleghany Springs of Virginia, he has an earnest of the advantage he is about to derive from change of air; and many a valetudinarian finds himself almost restored during the journey, fatiguing as it is, through the mountain regions, which have to be crossed before he reaches the White Sulphur, in Greenbrier county. Many persons, too, cannot drink that water with impunity, and, consequently, are indebted for their improvement chiefly to change of air; but somewhat, also, to varied scenery and society; absence from cares of business; and to greater regularity of living than they have been, perhaps, accustomed to. In making these observations, the author does not mean to affirm that mineral waters, as in the case of the valuable spring in question, are not occasionally important agents in the cure of disease; but, taking invalids in general, he is satisfied, that more is dependent upon change of air and habits than upon the waters. The inhabitant of an Atlantic city, and of most of the districts to the east of the Blue Ridge, removes from a hot atmosphere to one which is comparatively cool, and where all the diseases that are common to hot and malarious climates are extremely unfrequent, and many of them unknown. The advantage is obvious. He escapes the diseases which might have attacked him, had he remained through the summer in his accustomed locality; and hence many of the wealthy families of the lower country are in the habit of spending those months in the mountain regions, in which they are especially liable to disease in their own malarious districts. We can thus understand the reputation acquired by the inert Bath, and the Matlock waters of England, the latter of which has scarcely any solid ingredient; and yet what crowds flock to these agreeable watering-places; to the former for the perpetual amusements that keep the mind engaged, and cause it to react beneficially on the corporeal or mental malady;—to the latter, for the enjoyment of the beauties of nature for which Derbyshire is so celebrated. It is obvious that were such waters bottled, and sent to a distance, so that the invalid might drink them at his own habitation, the charm would be dissolved. The garnitures—more important, in this case, than the dish—would be wanting, and the banquet would be vapid, and without enjoyment or benefit. Less than twenty years ago, amidst the bubbles that were engaging the minds and money of the English public, it was proposed to carry sea-water by pipes to London, in order that the citizens might have the advantage of sea-bathing without the inconvenience of going many miles after it. Had the scheme been carried into effect, the benefits from metropolitan sea bathing would not have

exhibited themselves comparable in any respect to those of the same agent employed at Brighton or at Margate.

It is manifest, then, from what has been said, that neither the waters drunk at a distance, as in Philadelphia, nor any artificial waters, can be taken with the same advantage as the water at the springs; and if the artificial mineral waters were sent from Philadelphia, and taken at the source, they would, doubtless, in many cases, produce the same effects as the native water, especially if the invalid did not know that he was taking an artificial preparation.

Again: when an inquiry is made into the character of the diseases that are most benefited by a visit to watering-places, it is found, that the large mass of them are really such as are removable by simple change of air. Both change of air and the use of the waters are inadmissible during the existence of acute affections; but when the violence of the disease has passed away; and the inflammation—especially if it be seated in the mucous textures—has become chronic, the beneficial influence of change of air, under proper precautions, is marked. Hence it is that travelling, which combines a modification of the atmospheric influences surrounding the patient, with proper exercise, is so salutary in chronic irritation of the mucous membrane of the intestines and of the bronchia. Many of the cases, indeed, that have been looked upon as phthisis, removed by this course, have been chronic bronchitis; and one of our mineral waters has gained a reputation for the cure of pulmonary affections, which ought rather, perhaps, to be referred to the change of air, and other physical and moral circumstances that impress the patient.

That change of air and of habits is capable, indeed, of accomplishing all that our mineral waters can do, is exhibited by *Hydropathy*—the *Wassercur*—in which no article of the *materia medica*, and nothing but the pure element, is used; and it is found that the cures are mainly effected upon such patients as are in the habit of being sent to watering-places. The hydropathist proposes to cure all diseases, that are not in such a stage as to be absolutely incurable, by cold water used externally and internally;—along with constant exposure to mountain air; active exercise; total abstinence from all distilled and fermented liquors; plain coarse food; hard straw mattresses; and in the establishment of Priessnitz—the founder of the system—at Gräfenberg—we are told, the patient inhales an atmosphere not of the purest,—being contaminated by a smell, in part arising from the cows which are kept in stables beneath the house, in part from *cabinets d'aisance* upon the staircase, and from the kitchen beneath the common room, which opens into it by a trap-door, through which the cooked food, as well as the various odours find entrance. Priessnitz lives in the mountains of Silesia; and when we take into consideration the entire change that must be experienced by his patients in their journey thither; and, in the case of the better classes, in their mode of life when they are there, we need hardly be surprised that all those affections that are capable of being removed by revellents should yield to his efforts. The *Leintuch*, or the application of the wet sheet; the *Abreibung*, or rubbing down with the same; the use of the sweating blanket, the patient being packed up in a blanket, feather-bed, and wadded counterpane, until he sweats;

the different forms of baths and wet bandages ; the drinking of eight to twelve glasses of water daily, each glass holding nearly three quarters of a pint ; the coarse hard fare, and the regulated exercise already referred to, are well calculated to induce a new action in the functions, and to afford relief in a multitude of chronic cases.

Of the use of cold water externally and internally, the therapist has availed himself in all ages, and has ever been impressed with its important agency in a variety of morbid cases ; but a systematic application of cold water in a distinct establishment, with an enforced diet and regimen, is the offspring of modern times only. In a letter to the Rev. Mr. Cole, dated in 1775, Horace Walpole says :—" Dr. Heberden, as every physician, to make himself talked of, will set up some new hypothesis, pretends, that a damp house, and even damp sheets, which have ever been reckoned fatal, are wholesome : to prove his faith, he went into his new house, totally unaided, and survived it ;" and he adds,—" at Malvern,"—the seat, by the way, of an extensive hydropathic establishment at the present day, conducted by Dr. Gully, a regularly educated member of the profession—" they certainly put patients into sheets just dipped in the spring."

It matters not that this method may have originated in, and been sustained by, empiricism, and for the vilest and most mercenary purposes, the good which philosophy can select from it should be carefully separated, and unhesitatingly embraced. " The absurdity of the ' hydropathic ' treatment"—says a recent writer, Dr. Carpenter—" consists in its indiscriminate application to a great variety of diseases ; no person, who has watched its operation, can deny, that it is a remedy of a most powerful kind ; and if its agency be fairly tested, there is strong reason to believe, that it will be found to be the most valuable curative means we possess for various specific diseases, which depend upon the presence of a definite ' materies morbi ' in the blood, especially gout and chronic rheumatism ; as well as for that depressed state of the general system, which results from the ' wear and tear ' of the bodily and mental powers."

But although in the mass of cases, a journey to, and residence at, any of our mineral springs or at the sea side would prove effective in restoring the invalid, whether the waters were taken or not, it cannot be doubted, that many of them are excellent therapeutical agents, when judiciously employed. The thermal springs, for example, have the important advantage, that whilst the patient is immersed in them, they continue of the same temperature ; and hence their value over any artificial thermal bath, the temperature of which, under every precaution, must vary ; but it may be questioned, and has been questioned, whether the sulphurous, the saline, the chalybeate, the alkaline, or the ioduretted waters, really possess much more virtue than any analogous artificial solutions. It is a common remark, that the small quantity of saline matter contained in mineral waters produces a much greater effect than would result from an artificial solution of the same strength ; but this is questionable. The visiter at the Saratoga Springs takes several tumblers of the water at the fountain before breakfast ; but it would not be an easy matter to persuade a patient to drink as much of the artificial

water ; and until this is done, we have not the necessary elements for a fair comparison.

Where many springs are seated near each other, personal interest is energetically exerted, and is often sufficient to induce a trial of them all. One spring is reported to be valuable in a particular disease, or class of diseases ; and another in another ; and it becomes the routine—as in the case of the Trans-Alleghany Springs, of Virginia,—to make a regular tour ; so that before the invalid quits the region, he must have sojourned for a while at the Warm Springs, then at the Hot Springs : and must stay in turn at the Red Sulphur, the Salt Sulphur and the White Sulphur, finishing with the Sweet Springs, which is a carbonated water. In this manner, it is difficult to arrive at any correct appreciation of the virtues of any of them. It is rare, too, for a physician to practise at all of them in turn : he generally establishes himself at some one spring ; and is, consequently, unable to make a comparison between it and others. Too commonly, moreover, his object is merely to practise his profession amongst the assembled visitors ; and he may be incapable, either for want of ability, opportunity, or inclination, to enter upon the task.

In the Pyrenees, there are, it appears, upwards of fifty sulphurous springs, to each of which some special virtue is ascribed. The waters of Bonnes are reputed to be best for diseases of the chest ; but those of Chaudes are preferred by some ; Cauterets, and Bagnères de Luchon by others. All sulphurous waters, as has been observed by recent therapeutical writers, Messrs. Trousseau and Pidoux, are considered everywhere to exert marvellous powers over phthisis. The Red Sulphur Springs of Virginia have had this reputation for a long time. The White Sulphur waters, and those of the Salt Sulphur, are doubtless as beneficial ; but the fogs, to which the White Sulphur are subject, render it by no means a fitting sojourn for the phthysical valetudinarian. Aix in Savoy, Aix-la-Chapelle and Enghien, enjoy the antiphthysical reputation of sulphurous waters in general. Perhaps—so far as the waters go—the sulphohydric acid causes the good effects, if such effects be referable to the waters, which may admit of question ; and if this be the sanative agent, it can be prepared artificially, and ought to exhibit some power over phthysical cases treated at home ; yet who would place confidence in it without the revulsion which is its accompaniment when drunk hundreds of miles away from home ?

From the prominent ingredients of mineral waters, we can readily pronounce as to their general therapeutical virtues. Some of them are cathartic ; others diuretic ; others tonic, and others eutrophic. Most of them increase the urinary secretion, but this may be often dependent upon the quantity of water taken, which passes into the mass of blood, and is separated by the kidneys. It is by thus entering the blood-vessels, that they produce those eutrophic effects to which reference has been made already, (Vol. ii. p. 277,) and that old morbid cachexies disappear under their prolonged use. Still, as regards this very action, it is probable that an equally beneficial result would ensue upon the employment, equally prolonged, of an artificial water of a similar kind, if it had the same extrinsic circumstances associated with it ; hence the

conclusion to which the therapeutists already quoted have arrived, can scarcely be esteemed wide of the truth. "We believe," they observe, "that mineral waters are very efficacious; we think their power is considerably aided by the change in the hygienic condition of the patient; we are satisfied, that artificial mineral waters are as efficacious, and, at times, more efficacious, than natural waters, when the patient will take them in the same manner; but as we cannot prevail upon him to submit at home to the same abnegation, the same change in all his habits, and the same perseverance as at the natural springs, we shall still send, and everybody will send, patients to drink, on the spot, waters, which but few will consent to drink anywhere else." MM. Trousseau and Pidoux ought, however, to have added, that even should patients consent to take the remedy freely at home, and submit to the same change of regimen, still, the mutation of atmospheric influences, and the travelling exercise in a journey to the springs, especially if at a considerable distance, and in a more elevated region—as is the case with the mountain-springs of this and other countries—are therapeutical agencies of the greatest influence.

Under MINERAL WATERS are classed all those that contain saline or gaseous substances, or both, in sufficient quantity to be possessed of medicinal properties; or whose temperature differs from that of the ordinary springs of the region. The following table exhibits the temperature and active mineral ingredients of the chief waters.

TABLE
OF SOME OF THE PRINCIPAL MINERAL WATERS.

Springs.	Where situate.	Temperature.	Active constituents.
Acqui,	Piémont.	167°	Sulphohydric acid and chloride of sodium.
Aix,	Piémont, Savoie.	98	Sulphohydric acid.
Aix-la-Chapelle,	Germany.	134	Sulphohydric acid, chloride of sodium, and carbonate of soda.
Aix, in Provence,	France, (Bouches du Rhône.)	91	Traces of carbonic acid.
Arles,	France, (Pyren. Orient.)	103 to 145	Sulphohydric acid.
Audinac,	France, (Arriège.)	67	Sulphohydric acid, sulphate of magnesia.
Ax,	France, (Arriège.)	Thermal	Sulphohydric acid.
Baden, in Aargau,	Switzerland.	167	Sulphohydric acid.
Baden, in Swabia,	Germany.	112 to 145	Sulphohydric acid, chloride of sodium, sulphate of soda.
Bagnères de Bigorre,	France, (H. Pyrén.)	129	Sulphate of magnesia.
Bagnères de Luchon,	France, (H. Garonne.)	69 to 148	Sulphohydric acid.
Bagnoles,	France, (Orne.)	78 to 82	Sulphohydric acid, carbonic acid, chloride of sodium.
Bagnols,	France, Lozère.	109	Sulphohydric acid.
Balaruc,	France, Hérault.	116	Chloride of sodium, chlorohydrate of magnesia, carbonic acid.
Balston Spa, — Sans Souci Spring,	United States, New York.		Chloride of sodium, bicarbonates of soda and magnesia, carbonate of iron, and iodide of sodium.
Baréges,	France, (Hautes-Pyrén.)	85 to 112	Sulphohydric acid.
Bath,	England.	112 to 116	Chloride of sodium, sulphate of soda and carbonic acid; chiefly calcareous salts.
Bedford,—Anderson's Spring,	United States, Pennsylvania.		Carbonic acid, sulphate of magnesia, chlorides of sodium and calcium, carbonate of iron.
Bonnes,	France, (Bass-Pyrén.)	78° to 98	Sulphohydric acid.
Bocklet,	Bavaria.		Carbonic acid, iron.
Bourbon-Lancy,	France, (Saône et Loire.)	132	Chloride of sodium, carbonic acid.
Bourbon-l'Archambault,	France, (Allier.)	136 to 140	Sulphohydric acid, carbonic acid, iron.
Bourbonne-les-Bains,	France, (Haute Marne.)		Chloride of sodium.
Bristol,	England,	74	Sulphate of soda, chlorides of sodium and magnesium.
Bruckenaui,	Bavaria,		Carbonic acid, iron.

Springs.	Where situate.	Temperature.	Active constituents.
Bussang,	France, (Vosges.)	Cold.	Carbonic acid, carbonate of soda, iron.
Buxton,		82	
Cambo,	France, (Basses-Pyrén.)	{ 69	Sulphohydric acid.
Campagne,	France, (Aude.)	{ 62	Carbonic acid, iron.
Carlsbad,	Bohemia.	80	Sulphate of magnesia, chlorhydrate of magnesia.
Cauterets,	France, (H. Pyrén.)	121 to 167	Carbonic acid, sulphate of soda, carbonate of soda, chloride of sodium.
Chateldon,	France, (Puy de Dôme.)	123	Sulphohydric acid.
Chaudes-Aigues,	France, (Cantal.)	191	Carbonic acid, iron.
Cheltenham,	England.		Carbonic acid, carbonate of soda, chloride of sodium.
Contrexeville,	France, (Vosges.)		Chloride of sodium, sulphate of soda, sulphate of magnesia, carbonic acid, carbonate of iron.
Creuznach,	Germany.		Carbonic acid, a little sulphate of magnesia, chloride of sodium, and iron.
Dax,	France, (Landes.)		Iodine, bromine, chlorides of sodium and calcium.
Dunblane,	Scotland.	76 to 133	A little chlorhydrate of magnesia, sulphate of soda.
Ems,	Germany.		Sulphate of soda, chlorides of sodium and calcium, and carbonate of iron.
Enghien-Montmorency,	France, (Seine et Oise.)	83 to 115	Carbonic acid, bicarbonate of soda, chloride of sodium.
Epsom,	England.		Sulphohydric acid.
Forges,	France, (Seine infér.)		Sulphate of magnesia.
Franzensbad,	Bohemia, Eger.		Iron.
Furnas,	St. Michael's, Azores.	Thermal.	Sulphate of soda, carbonate of iron, carbonic acid gas.
Gastein,	Austria, Noric Alps.	118	Carbonic acid, carbonate of iron.
Gréoulx,	France, (Basses-Alpes)	85 to 96	Sulphohydric acid.
Hall,	Upper Austria.		Iodine.
Harrowgate,	England.		Carbonic acid, sulphohydric acid.
Hot Springs,	United States, Va.	107	Carbonate of magnesia, chlorides of sodium, and magnesium.
Ischl,	Upper Austria.		Iodine, bromine.
Kilburn,			Carbonic acid, sulphohydric acid; carbonates of lime, magnesia and iron; sulphates of soda, lime, and magnesia; chloride of sodium.

Springs.	Where situate.	Temperature.	Active constituents.
Kissengen,	Bavaria.		Carbonic acid, chloride of sodium.
La Maréquerie, Lamotte, La-Roche-Posay, Leamington,	France, (Seine infér.) France, (Isère.) France, (Vienne.) England.	184	Iron. Sulphohydric acid. Chloride of sodium, sulphate of soda, chlorides of calcium and magnesium.
L'Épinay, Lucca,	France, (Seine infér.) Italy.	94 to 130	Iron. Carbonic acid, sulphates of alumina, soda, magnesia and iron.
Luxeuil,	France, (Haute-Saone)	125	Chloride of sodium, carbonate of soda.
Malvern,	England.		Carbonates of soda and iron, sulphate of soda, chloride of sodium.
Matlock, Marienbad, — Kreuzbrunn, Moffat,	England. Bohemia. Scotland.	66	Sulphate of soda, carbonate of iron, carbonic acid gas. Carbonic acid, sulphohydric acid and azote; chloride of sodium.
Mont Dore,	France, (Puy de Dôme.)	112	Carbonic acid, bicarbonate of soda, chloride of sodium, sulphate of soda.
Névis, Niederbronn,	France, (Allier.) France, (Bas-Rhin.)	136 to 148 Cold.	Chloride of sodium, sulphate of magnesia, carbonic acid.
Niton,	England, Isle of Wight		Iron, sulphate of alumina and potassa.
Passy, Pfeffers Pitcaithley,	France, (Seine.) Swiss Alps. Scotland.	100	Iron. Chlorides of sodium and calcium.
Plombières,	France, (Vosges.)	132 to 166	Carbonate of soda, sulphate of soda, and chloride of sodium.
Pougues,	France, (Nièvre.)		Carbonic acid, carbonate of soda.
Provins,	France, (Seine et Marne.)		Carbonic acid, iron.
Püllna,	Bohemia.		Sulphates of soda and magnesia, chloride of magnesium, iron
Pyrmont,	Westphalia.		Carbonic acid, carbonate of magnesia.
Rennes,	France, (Aude.)	103 to 121	Carbonic acid, chlorohydrate of magnesia.
Roisdorff,	Germany.		Carbonic acid, carbonate of soda.
St. Amand,	France, (Nord)	64 to 82	{ Waters. Carbonic acid, sulphohydric acid. Deposit, (Boue,) sulphohydric acid, salts of iron and magnesia.

Springs.	Where situate.	Temperature.	Active constituents.
St. Nectaire,	France, (Puy de Dôme.)	75 to 103	Carbonic acid, bicarbonate of soda, chloride of sodium.
St. Pardoux, St. Sauveur,	France, (Allier.) France, (Hautes Pyrénées)	76 to 93	Carbonic acid, iron. Sulphohydric acid.
Saratoga, — Congress Spring,	United States, New York.		Carbonic acid, chloride of sodium, iodide of sodium; bicarbonates of soda and magnesia; carbonate of iron, bromide of potassium.
Walton or Iodine Spring,	United States, New York.		Chloride of sodium, carbonate of magnesia, iodide of sodium.
Sea water,			Chlorides of sodium, magnesium and calcium; sulphate of magnesia.
Scarborough, Schlangenbad,	England. Germany.	86	Sulphate of magnesia, iron. A little carbonic acid and carbonate of soda.
Schwalbach, Seidlitz,	Germany. Bohemia.		Carbonic acid, iron. Sulphate, carbonate, and muriate of magnesia, carbonic acid.
Seltzer,	Germany.		Carbonic acid, chloride of sodium.
Seidschütz,	Bohemia.		Sulphate of magnesia, carbonic acid.
Spa,	Belgium.		Iron, carbonic acid.
Tarascon, Töplitz,	France, (Arriège.) Bohemia.	114 to 122	Carbonate of soda, chloride of sodium, sulphate of soda.
Tunbridge,	England.		Carbonic acid, carbonate of iron, sulphate of magnesia.
Ussat,	France, (Arriège.)	93 to 98	Carbonic acid, chlorhydrate of magnesia.
Vals,	France, Ardèche.	96	Bicarbonate of soda, carbonic acid.
Vichy	France, Allier.	90 to 112	Bicarbonate of soda, carbonic acid.
Warm Springs,	United States, Virginia.	97	
White Sulphur,	United States, Va.		Sulphohydric acid, carbonic acid, sulphate of magnesia.
Wisbaden,	Germany.	158 to 160	Chloride of sodium.

It is impracticable to make a well defined classification of mineral waters, except where they contain—which, as will be seen, by the table, is rarely the case—but a single mineralizing ingredient. In many it is difficult to say, which exerts the predominant influence. It is the custom to range them into certain classes, which admit of a more ready appreciation of their general properties. Perhaps, the least objectionable division is the following:—1. *Simple thermal waters*; 2. *Saline aperient waters*; 3. *Alkaline waters*; 4. *Sulphurous waters*; 5. *Iodurated waters*; 6. *Chalybeate waters*; and 7. *Carbonated waters*.

The chief THERMAL SPRINGS of the United States are the Warm Springs and Hot Springs of Virginia; the Warm Springs of Buncombe county, North Carolina (94° to 104°) and the Hot Springs of Arkansas, (167° to 210°); in England, those of Bath, Bristol, and Buxton. In France, Germany and Italy, they are numerous; but, as seen by the tables, are rarely simple; containing, at the same time, various mineral impregnations. On these, their virtues as internal agents are altogether dependent. When applied externally, their effects may vary according to the character of the impregnation; those of simple thermal waters are dependent upon temperature and moisture. They are the same, in other words, as those of *warm water* and *hot water baths*, whose properties have been mentioned in another part of this work, (see Vol. i. pp. 329 and 505.) They have the great advantage, however, already alluded to—in rheumatic and other diseases—that their temperature continues the same, whatever may be the duration of the immersion.

2. SALINE APERIENT WATERS contain chiefly sulphate of soda, sulphate of magnesia, chloride of sodium, and chloride of magnesium, singly or associated. Most of these are cold springs—as those of Kissengen, Marienbad, Franzensbad, Cheltenham, Leamington, Harrowgate, and Scarborough; and in this country, the White Sulphur, Salt Sulphur and Red Sulphur of Virginia.

THERMAL SALINE WATERS are found at Wisbaden, and Baden Baden in the neighbourhood of Wisbaden. The Hot Springs and Warm Springs of Virginia contain but little saline impregnation. All these waters act as cathartics and diuretics; but they require to be taken with caution; for if used too freely, they bring on fever with gastro-enteric irritation, and a sense of fulness in the head. Their protracted use, too, may be of great advantage in diseases that require the employment of saline eutrophics.

3. The important ingredients in the ALKALINE WATERS are bicarbonate of soda and carbonic acid. Vichy is the most celebrated of these. It is thermal-alkaline; and so are Mont-Dore, Ems, Töplitz, Schlangenbad, and Roisdorff. The alkaline springs of this country are cold. Those of Saratoga and Balston are the most celebrated.

4. In the SULPHUROUS WATERS, the characteristic ingredient is sulphohydric acid; generally associated with saline substances, but sometimes existing alone, or nearly so, as in the thermal waters of Baréges, the Warm Springs and the Hot Springs of Virginia, &c. The main *sulphuro-saline* waters are the thermal springs of Aix-la-Chapelle, Acqui, Audinac,

&c., the cold springs of Moffat, and Harrowgate; and the White Sulphur, Red Sulphur, Salt Sulphur, &c., of Virginia.

These waters are laxative and eutrophic, and adapted, therefore—both when used internally and externally—for all the cases in which sulphur is needed as a laxative (Vol. i. p. 162,) or as a eutrophic. (Vol. ii. p. 328.)

5. IODURETTED WATERS always contain a salt of iodine associated with chloride of sodium. The chief springs of this kind are those of Saratoga and Balston in this country; of Woodhall near Ashby de la Zouch in England; and of Creuznach in Germany. The properties of these waters are therefore dependent upon the joint influence of iodine and chloride of sodium; and their prolonged use is beneficial in scrofula, and in other cases, in which the eutrophic agency of iodine, or chloride of sodium, or of both, is indicated.

6. CHALYBEATE WATERS are numerous everywhere. As is shown by the table, many of the saline aperient waters contain iron in the form of carbonate or sulphate. The most celebrated of the decided chalybeates abroad, are Spa, Pyrmont, Schwalbach, Marienbad, Tunbridge Wells, &c.; in this country, Balston, Saratoga, Bedford (Pa.), and Brandywine. As the iron is associated with free carbonic acid in most of the springs, the virtues which the waters enjoy must be dependent upon both. A simple chalybeate water is adapted for all cases in which chalybeates in a great state of dilution appear to be required: the carbonic acid, in addition, acts as an excitant; and, with some, produces exhilaration and an approach to intoxication. Carbonated chalybeates have, therefore, to be used with caution, especially in highly impressible individuals.

7. Simple CARBONATED WATERS are altogether indebted to carbonic acid for their efficacy. The Sweet Springs in Monroe county, Virginia, are the best specimen in this country. The temperature is 73°. Most of them contain either carbonate of soda or iron, or both; and their medical efficacy is, of course, partly dependent upon the amount of these ingredients. The carbonic acid always, however, communicates decided qualities to them. It gives them their sparkling briskness and piquant taste; their excitant agency upon the stomach, and their exhilarating effect upon the whole system. The water at Pyrmont in Westphalia, which contains iron, and is highly charged with carbonic acid, is said to be drunk by the country people, partly as a medicine, and partly on account of the kind of intoxication it induces. Congress and other waters of Saratoga, and Seltzer are mainly indebted for their agreeable qualities to the carbonic acid they contain. This, too, is the pleasant ingredient in the effervescing draught; in soda powders, and in mineral water from the fountain;—and it is to it, that these preparations owe their power of arresting vomiting, when not dependent upon inflammation of the stomach; and that soda water, and Seltzer water aid digestion, when taken during a repast. As a refrigerant, carbonated water has been treated of already. (Vol. ii. p. 211.)

The United States Pharmacopœia has a formula for

AQUA ACIDI CARBONICI, CARBONIC ACID WATER, *Artificial Seltzer water,*

which is formed by throwing into a suitable receiver nearly filled with *water*, by means of a forcing pump, a quantity of *carbonic acid* equal to five times the bulk of the water. The carbonic acid is obtained from marble by means of dilute sulphuric acid. This is the *soda water* or *mineral water* of the shops.

In regard to the external use of mineral waters, much need not be said. They produce their effects partly by their temperature, and partly by the particular mineral impregnation which they contain. The effects of these will be understood by comprehending those of the impregnations themselves. Saline and sulphurous waters stimulate the skin more than pure water of the same temperature; and the latter exert a valuable agency in chronic cutaneous and other affections in which sulphur is beneficial. The *Boue des Eaux* or deposit from the sulphurous waters is often an excellent application to various inveterate cutaneous diseases.

SECTION XI.

ON THE COMBINATION OF THERAPEUTICAL AGENTS.

Importance of a due attention to principles—Value of authority—Professional qualifications may be estimated by the prescription—Evils of complexity in prescribing—Rules for prescribing—Table of incompatibles—Doses of medicines—Conclusion.

THE main admitted classes of therapeutical agents, or of those which ought perhaps to be admitted, have now been examined. It is rare, however, for the practitioner to draw his resources, in the management of disease, from one class only. Even in the treatment of febrile and inflammatory diseases—for which sedatives are so admirably adapted—he not unfrequently has recourse to some of the classes of excitants. Thus he prescribes emetics, cathartics, diaphoretics, and revellents; and often—when appropriately directed—with marked advantage; but, under other circumstances, with decidedly evil consequences. Yet, it is obvious, that they cannot be esteemed direct or true antiphlogistics. The actual immediate operation of these evacuants is the opposite of that produced by sedatives or true antiphlogistics: their antiphlogistic effect is only secondary; and, at times, they cause inflammation of the tissues on which their action is immediately exerted, without inducing their specific operation.

This is, doubtless, one of the modes in which these '*local stimulants*' prove injurious; but—to take the case of cathartics—even if they excite the secretion of the lining membrane of the intestinal canal, and produce evacuation after evacuation, as is too often done in febrile diseases, the perturbation, which they induce in the economy, may be attended with results anything but antiphlogistic; and, accordingly, they are now generally employed in the ordinary fevers of our country,

chiefly with the view of keeping the intestinal canal free from morbid secretions and accumulations,—not so much as depletives; whilst the trust of the practitioner is reposed rather in the proper use of sedatives,—as blood-letting, general, or local, or both, as the case may require; refrigerants; nauseants and narcotics; with a strict inculcation of mental and corporeal quietude,—than in the mixed sedative and perturbing plan of management, which was at one time universal; and still lingers with many of the older practitioners especially.

To one who has been taught, that the old method of management is essential, and who has employed no other, the success that attends this milder, more soothing, and more philosophical treatment may appear incredible. The author can affirm, however, from the results of both public and private experience, that it is so generally successful, that a death from bilious fever, is—in his observation—a not very common event. Similar testimony is afforded by an experienced observer, Professor Jackson, of Philadelphia, in favour of a mode of management perhaps even less active than the one which the author has inculcated,—so far as regards the employment of local stimulants of the kind referred to. “Follicular enteritis,” he says, “known more familiarly under the names of typhoid fever, typhoid remittent, and bilious fever, I find to be infinitely more manageable when treated with occasionally local depletion, as it may be indicated by local symptoms, the expectant method, and alterative doses, than by the perturbing and evacuant plan. Under this course, I rarely see it fatal.”

The antiphlogistic or sedative treatment is, doubtless, the main stay of the practitioner in febrile maladies; but still, as shown under the proper heads, mild evacuants are necessary throughout their whole course; and, when they become protracted,—upon the principle of revulsion, agents may be demanded, the propriety of whose use in the earlier periods might be more questionable.

In all cases of disease, the physician must investigate the nature of the morbid action. This—as elsewhere remarked—must be the point of departure for his therapeutical indications; and a wise knowledge of the properties of his medicinal agents will enable him to carry into effect those indications:—but he must not vacillate. Let his therapeutics be guided by great general principles; and let him not fly from one indication to another, because the morbid condition may not be—or may not seem to be—yielding. If his principles be accurate, his indications will correspond; and if not satisfied with his indications, there can be but little safety for the patient in the empiricism that must necessarily be the rule of conduct under such circumstances. It is an unfavourable index of the attainments of a physician, when he places undue store on some formula or agent for the cure of special morbid conditions. It is *primâ facie* evidence of faulty observation, and defective induction. It indicates a mind that searches after facts—too often ‘false’—rather than after great principles;—that is swayed by prepossessions rather than by true experience,—and that ought not to be trusted on trying or unusual occasions. To the possessor of such a mind, the advice of Swift to a young author,—if he had written anything which he thought particularly fine, to strike it out,—might not be inappropriate. The loss of the

result of the practitioner's observation,—true or false, would be but trifling; whilst the reception of a false fact, and its admission as a ground of action, might be unfortunate.

Primerose, in his work 'On common errors in physic,' (*De Vulgi Erroribus in Medicinâ*, Amstelod. 1639,) has a chapter, entitled '*Non esse mutanda remedia etiamsi curatio statim non succedat*,'—'that remedies are not to be changed, although a cure may not immediately follow,'—and the remark is as applicable at the present day as it was in his time. If due attention have not been paid to the investigation of the disease,—if any uncertainty exist as to its nature, or as to the powers of the therapeutical agents had recourse to,—or if the physician be thrown off his balance by unreasonable expectations, or by petulance on the part of the patient,—he is apt to fly from one plan of treatment, or from one remedy to another; and, in this manner, to become bewildered. On all these accounts, it will be understood, that this fault ought to be more observable in young practitioners than in old; and so striking is it apt to be in them, and so fraught with multitudinous evils, that it has been regarded by the author as a solemn duty yearly to caution the student against it;—inculcating, at the same time, the necessity for inquiring strictly into the precise nature of the morbid phenomena that present themselves in any case that may fall under his attention, and of well comprehending the effects which his remedial agents are capable of exerting on the vital properties in health and disease; and when, after an ample investigation, he has laid down his indication of treatment, and decided upon the therapeutical agents that are adapted for fulfilling such indication, that he should not be disheartened, if he find his patient in the same condition at his subsequent visits; but persevere in his plan of treatment, unless some new and more philosophical view should present itself, which may lead him to infer, that the indication previously embraced and followed had been defective.

There is no circumstance which is so much calculated to render the young practitioner dissatisfied with the practice of his profession as this vacillation from one remedy to another without adequate reason. Instead of daily adding to his stock of valuable practical knowledge, his *experience* becomes the result of incessant empirical trials with various articles of the *materia medica*, and is almost constantly false;—the danger being, in all such cases, that the agent last prescribed may absorb the whole credit of the cure; whilst, in many instances, it may have been inoperative, and the successful result been owing to that instinctive action of recuperation which is seated in all organized bodies—vegetable as well as animal—and which is capable of repairing injuries, when such injuries do not overstep certain limits. The proper course for the physician to pursue in the treatment of chronic diseases—for to such these remarks are more especially applicable—is well expressed by Hippocrates in his aphorism:—'*Omnia secundum rectam rationem facienti, si secundum rationem non succedat, non est ad aliud transeundum, quamdiu id manet quod ab initio visum fuit*.' 'He who does everything in accordance with sound reason need not pass to anything else—provided the thing does not succeed according to reason—so long as

everything is in the state it appeared to be in the beginning.' It may be requisite, however, at times, to alter the form of a medicine, where, as in chronic diseases, the patient has become wearied of so long employing the same form; and for the reason, also that—without such variation—the remedy may lose its intrinsic powers in consequence of the system having become habituated to it.

Connected with this subject, Professor Bigelow, of Boston, has some judicious remarks, which strikingly exhibit the fallacious mode of reasoning, adopted by too many, in their investigation of disease, and of the proper adaptation of remedies. "The foundation of all knowledge is truth. For truth, then, we must earnestly seek, even when its developments do not flatter our professional pride, nor attest the infallibility of our art. To discover truth in science is often extremely difficult; in no science is it more difficult than in medicine. Independently of the common defects of medical evidence, our self interest, our self-esteem, and sometimes even our feelings of humanity, may be arrayed against the truth. It is difficult to view the operations of nature, divested of the interferences of art, so much do our habits and partialities incline us to neglect the former, and to exaggerate the importance of the latter. The mass of medical testimony is always on the side of art. Medical books are prompt to point out the cure of diseases. The young student goes forth into the world, believing that if he does not cure diseases, it is his own fault. Yet when a score or two of years have passed over his head, he will come at length to the conviction, that some diseases are controlled by nature alone. He will often pause at the end of a long and anxious attendance, and ask himself, how far the result of the case is different from what it would have been under less officious treatment than that which he has pursued; how many in the accumulated array of remedies, which have supplanted each other in the patient's chamber, have actually been instrumental in doing him any good. He will also ask himself, whether, in the course of his life, he has not had occasion to change his opinion, perhaps more than once, in regard to the management of the disease in question, and whether he does not, even now, feel the want of additional light?——We are seldom justified in concluding, that our remedies have promoted the cure of a disease, until we know that cases, exactly similar in time, place, and circumstances, have failed to do equally well under the omission of those remedies; and such cases, moreover, must exist in sufficient numbers to justify the admission of a general law on their basis. Nothing can be more illogical than to draw our general conclusions, as we are sometimes too apt to do, from the results of insulated and remarkable cases; for such cases may be found in support of any extravagance in medicine; and if there is any point in which the vulgar differ from the judicious part of the profession, it is in drawing premature and sweeping conclusions from scanty premises of this kind. Moreover, it is in many cases not less illogical to attribute the removal of disease, or even of their troublesome symptoms, to the means which have been most recently employed. It is a common error to infer that things, which are consecutive in the order of time, have necessarily the relation of cause and effect. It often happens that the last remedy used bears off the

credit of having removed an obstruction, or cured a disease, whereas in fact the result may have been owing to the first remedy employed, or to the act of nature uninfluenced by any of the remedies.——In the study of experimental philosophy, we rarely admit a conclusion to be true, until its opposite has been proved to be untrue. But in medicine we are often obliged to be content to accept as evidence the results of cases which have been finished under treatment, because we have not the opportunity to know how far these results would have been different, had the cases been left to themselves. And it too frequently happens, that medical books do not relieve our difficulties on this score, for a great deal of our practical literature consists in reports of interesting, extraordinary, and successful results, published by men who have a doctrine to establish, or a reputation to build. ‘Few authors,’ says Andral, ‘have published all the cases they have observed, and the greater part have only taken the trouble to present to us those facts, which favour their own views. A prevailing error among writers on therapeutics proceeds from their professional, or personal, reluctance to admit that the healing art, as practised by them, is not, or may not be, all sufficient in all cases; so that on this subject they suffer themselves, as well as their readers, to be deceived.—Hence we have no disease, however intractable or fatal, for which the press has not poured forth its asserted remedies.——It is only when, in connection with these flattering exhibitions, we have a full and faithful report of the failures of medical practice, in similar, and in common cases, setting forth not only the truth, but the whole truth, that we have a basis sufficiently broad to erect a superstructure in therapeutics, on which dependence may be placed.”

The present is a period eminently characterized for the accumulation of clinical observations; and much valuable information has been collected; yet it is to be feared, the advantages, in this way obtained, have not been without countervailing results; and there are too many evidences of the minds of observers having been narrowed down to simple observation of occurrences, instead of being devoted to great general views. *Facts* have occupied the mind in place of *induction*. The senses have been engaged, whilst the higher powers of the intellect have, too often, been permitted to remain dormant.

The cases published in the various periodicals, with the *ex professo* treatises on medical clinics, are so numerous and diversified, that the searcher after great principles of pathology and therapeutics scarcely knows at what point to commence his investigations. Were all the recorded ‘*facts*’ registered, and detailed by observers of adequate talent and discrimination, the severity of the task would be greatly diminished; but, unhappily, this is not the case; and, hence, the difficulty, with the searcher after truth, is often extreme. If, indeed, we reflect on the mass of published cases, and the few—very few—that are alluded to as authorities on any point, we might have our medical ardour somewhat damped; and justly fear that all our labour might be fruitless, and that, in a few short years, the results might be consigned to that oblivion which has shrouded those of our predecessors. That many—perhaps most—of the clinical cases, which have been emanations of recent and

present periods, will meet with this fate, is doubtless ; but still, many must remain ; and a spirit of accurate observation, and faithful registration of the results of such observation, emanating from distinguished teachers of the day, and ramifying amongst their pupils, in every quarter of the globe, will persist after they have passed away, and cannot fail to develope useful results.

In an early part of this work, it was remarked, that where the pathological lesion is understood, the therapeutical indication will be clear ; and, in general, more easily fulfilled. No necessity will exist for complex combinations of different classes of medicinal agents ; or of different agents of the same class. In every case, before prescribing, all agents should be rejected, whose *modus operandi* has not been well settled by careful, repeated, and unbiassed observation. It has been well remarked, that a medicinal prescription should carry upon its very face an air of energy and decision, and speak intelligibly the indication it is destined to fulfill ;—and it may be laid down as a position, not in much danger of being controverted, that where the intention of a medical compound is obscure, its operation will be imbecile :—‘*Medicus vir prudens nihil præscribat, nisi cujus sufficientem queat reddere rationem, quum requiritur ; hinc nunquam tumultuario, sed semper ex indicatione prius ritè deducta agat.*’ (Gaubius.) There is, doubtless, truth, too, in the opinion entertained by some, that a practitioner’s professional abilities may be estimated somewhat by the character of his prescription,—the scientific physician not permitting any agent to enter without a satisfactory reason. Where no such reason can be adduced, there is usually cloudiness in the mind of the practitioner. What can the philosophic individual—professional or lay—think of the reasoning—if reasoning it may be called—of the country practitioner in England, who was celebrated for the complexity of the medicines which he gave to his patients—a complexity which was always, as might be expected, in a direct ratio with the obscurity of the case ? “If,” said he, “I fire a great profusion of shot, it is very extraordinary if some do not hit the mark” ! Or, of the subject of a similar anecdote, related by Sir Gilbert Blane, who, being asked by his patient, why he put so many ingredients into his prescription, answered, “in order that the disease may take that which it likes best ;” a feeling, which would have readily enabled him to range himself under the ‘good men and true’ of homœopathy, the believers in which—as has been elsewhere shown—maintain that there is a marked affinity between every disease and some particular article of the *materia medica*. Unlike, however, the practitioner in question, they endeavour to discover such agent ; and administer it *alone* in the disease for the removal of which it is considered to be specially adapted.

Where complexity is indulged, it is obviously impracticable to test, by any kind of experience, the properties of therapeutical agents, or to discriminate between the main sanative ingredients and such as are of no efficacy, or may even counteract them. “It is an opinion,” says Dr. Holland, “not unfrequent among medical men, that the multiplication of medicines in our hands adds in the same ratio to the power and facilities of practice. This view is admissible only in a very qualified sense. It

is, in truth, as correct to say, that the addition of new medicines or preparations, which do not expressly accomplish new purposes, or fulfill more advantageously those already attained, becomes an incumbrance to the practitioner, and an impediment to the progress of science. It may be alleged, and must be fully admitted, that combinations have often effects not resulting equally from any of their ingredients. This is true as respects many vegetable medicines of powerful action, whether narcotic, purgative, diuretic or alterative. It is especially true as regards chemical remedies, where changes of combination may occasionally be calculated upon favouring the effects desired; though much more frequently the facts by which their use is determined are merely empirical in kind. The observation of these facts is obviously one of the most important objects to the practitioner; but, it must be added, one of the most difficult also; for even in the simpler combinations we can rarely obtain that precise estimate of effects, which is so essential to the success and certainty of practice;—still less can we do so in those of a complicated kind. Each new ingredient added to a medicine increases in a higher ratio the chances of error, and obscures the evidence by which such error may be detected and removed. And the application of other science to this subject, though never to be lost sight of, is here made so uncertain by being subjected to vital actions, that it must ever be admitted with great caution, and wholly in subordination to experience. Several compound medicines of undoubted efficacy contradict chemical laws, even in the points where it might seem of greatest moment to maintain them.”

In forming an *extemporaneous* or *magistral* formula or *prescription*, the physician makes use of either the articles of the *materia medica*, or preparations that are kept in the shops of the apothecary, the formulæ for which are directed in the *National Pharmacopœia*, or—in other words—are *officinal*. At times, one of these articles will answer every purpose which the prescriber has in view; at other times, it is esteemed advisable to add some agent that may aid its operation; or, it may possess objectionable qualities which may require the addition of some ingredient to obviate or correct them; and lastly, it rarely happens, that medicines are in a form the most advisable for exhibition; and, accordingly, they require some material to give them the necessary constitution. Hence, it has been laid down, by most writers on Therapeutics, that every compound formula ought to consist of a *basis* or principal ingredient; an *adjuvant* or aid to the principal ingredient; a *corrigent* to modify any objectionable qualities of the base or compound; and a *constituent* or *excipient* to give form to the medicine—the *formgebende Mittel* of the Germans.

The basis and the excipient are the most essential components of a magistral formula, and must almost always, consequently, be present; yet the latter need not always form part of the prescription as sent to the apothecary. For example, twenty grains of rhubarb may be prescribed as a cathartic; without giving any directions as to the excipient or constituent. Occasionally, the constituent requires an *intermedium*, as where copiba is directed in the form of emulsion: yolk of egg or

mucilage in such case is the *intermedium*;—water the *constituent*. In the following prescription, all these ingredients are contained:

R.—Copaib. f.℥ij.	<i>Basis.</i>
Ol. Tereb. f.℥j.	<i>Adjuvant.</i>
Mucilag. Acaciæ f.℥iij.	<i>Intermedium.</i>
Ol. Ment. pip. ℥x.	<i>Corrigent.</i>
Aquæ f.℥vj.—M.	<i>Constituent.</i>

yet both the adjuvant and corrigent might be omitted.

Frequently, with the view of augmenting the action of the base or principal ingredient, the prescriber adds other preparations of the same agent, which may thus take the place both of adjuvant, corrigent, and constituent; for example, in the following prescription for a cathartic draught:

R.—Infusi Rhei f.℥xj.
Tincturæ Rhei f.℥j.—M.

The rhubarb is here the *basis* in both articles; the water of the officinal infusion is the main *constituent*; and the dilute alcohol of the tincture may act as a *corrigent*; whilst the tincture itself is unquestionably an *adjuvant*. In like manner, tincture of senna is added to infusion of senna; tincture of catechu to infusion of catechu; tincture of cinchona to infusion or decoction of cinchona, &c., &c. In the generality of cases, however, the prescriber combines different agents, which are possessed—as he conceives—of similar powers, in order that he may induce a more potent result than the basis alone might be capable of effecting. Combinations of this kind require judgment and accurate observation; the want of which is a great cause of the confusion perceptible in many extemporaneous formulæ, and from which certain officinal preparations are not altogether free.—Take, for example, *Electuarium opiatum polypharmacum* of the Parisian ‘*Codex*,’ which is retained as the lineal descendant of the ancient *Theriac*, with even an additional number of ingredients: it contains *acrid substances*, 5; *astringent*, 5; *bitter*, 22; *indigenous aromatics*, 10; *umbelliferous aromatics*, 7; *balsams and resinous substances*, 8; *fetid ingredients*, 6; *narcotics*, 1; *earthy substances*, 1; *gummy or amylaceous*, 4; *saccharine*, 3; total, 72; and one of these the *flesh of the viper*!—a little more than a grain of *opium*, which may be regarded as a principal effective ingredient, being contained in a drachm of the compound. Yet, when the question arose in the London College of Physicians, as to what should be the fate of this “many-headed monster,” and when it was proposed to eject it from the Pharmacopœia, it was found that the college was divided, and that fourteen members were for the measure, and thirteen against it; so that it was discarded by a majority of one only. (See the Preface to the author’s *New Remedies*, 5th edit. Philad. 1846.) Its place in the Pharmacopœias is now taken by *CONFECTIO OPII*, which, as elsewhere shown, (Vol. i. p. 356,) consists of opium—a narcotic,—cinnamon, ginger, cardamom, nutmeg, aromatic excitants, and clarified honey, the excipient. Of the combination of agents that are

possessed of similar powers, we have examples in common purgative mixtures; as where sulphate of magnesia, infusion of senna, and tincture of senna are associated in the same prescription;—in the ordinary emetic combination of tartrate of antimony and potassa and ipecacuanha;—in the officinal preparations, *EXTRACTUM COLOCYNTHIDIS COMPOSITUM*, (Vol. i. p. 200,) which is composed of colocynth, aloes, and scammony, cathartic ingredients; in *CONFECTIO SENNÆ*, (Vol. i. p. 183,) composed of senna, liquorice root, figs, pulp of prunes, pulp of tamarinds, pulp of purging cassia, &c., as mild cathartics; and in the *PILULÆ CATHARTICÆ COMPOSITÆ*, (Vol. i. p. 201,) composed of compound extract of colocynth, extract of jalap, mild chloride of mercury, and gamboge;—all cathartics.

The action of the basis or principal ingredient is, often, also, aided by the addition of some agent, which may not possess the same properties as the basis, and yet may make its operation more certain. The addition of tartrate of antimony and potassa, for example, to a cathartic, renders the intestinal canal more impressible to the action of the latter; and the addition of a tonic has frequently a similar effect.

In selecting his agents with the view of correcting the action of the basis or principal remedy, it is necessary for the prescriber to be well acquainted with its ordinary qualities and effects. Many cathartics, for example, cause tormina or nausea, which may be prevented by the addition of an aromatic, or of a small quantity of opium. The same corrigents are demanded when tonics, as cinchona in powder, or ferri subcarbonas, disagree, from quantity, with the stomach. Mild chloride of mercury, or mercurial pill, when administered with the view of causing the peculiar effects of mercurials on the system, is apt to pass off by the bowels, and thus defeat the wishes of the prescriber. He adds, therefore, a small quantity of opium to each dose to prevent this. Often, too, a disagreeable medicine, which might, otherwise, cause nausea and vomiting, may be retained by combining it with substances that mask its unpleasant character, and at the same time induce a different impression on the stomach. Turpentine, for example, is often rejected when merely dropped on sugar, or mixed with molasses; but it may be retained if made into an emulsion with yolk of egg, or mucilage as the intermedium; and peppermint water, which is an aromatic excitant, as the excipient or constituent. The same remarks apply to copaiba, which, at times, resists all the ingenuity of the physician, and is invariably rejected. The discovery of the mode of enveloping it in gelatin capsules (Vol. i. p. 487) was therefore valuable; for in many cases, doubtless, it is the disagreeable and enduring taste of the copaiba that occasions its rejection.

In an early part of this work, the author has dwelt upon the importance of laying down proper indications for the treatment of disease; and has dwelt at some length upon the extensive information in every department of his profession that is required of the competent therapist. If his indications be erroneous, and his information defective, so must be his practice. Especially liable to error is he, when the case seems to require separate and distinct indications, and he feels it, in consequence, necessary to combine substances which, individually, may

seem adapted for the fulfillment of an indication; and yet, when combined, may not answer for any. Cases repeatedly arise, where the indication may be, *first*, to evacuate the bowels, and *secondly*, to produce a tonic effect upon the digestive organs, and the system generally; hence, tonics and cathartics are associated with much propriety; cathartics, again, may require an association with opiates, as in cases of colic, and enteritis of the peritoneal coat;—a full dose of an opiate acting as a sedative, and relieving spasm of the muscular coat, whilst the cathartic acts upon the mucous coat, and augments the secretion from it. On this principle, calomel and opium are so often combined in the same formula.

In the combination of substances that act chemically upon each other, care is required, that the resulting compound may not defeat the intentions of the prescriber. Not many years ago, the author read a series of cases, in which dilute sulphuric acid had been successfully prescribed with acetate of lead in hæmoptysis! Yet the merest tyro in chemistry knows, that however appropriate either of these astringents might be, when taken singly, they must necessarily be inert in combination:—the sulphuric acid must lay hold of the oxide of lead of the acetate, and form an inert and insoluble compound; whilst the acetic acid will be separated, and can alone exert any dynamic action. In all the published cases, therefore, the fortunate issue must have been owing to the general treatment adopted along with these agents; or perhaps to the natural or instinctive actions unmodified by therapeutical management.

It is important, consequently, for the physician to be acquainted with the therapeutical agents, that are incompatible in the same prescription, before he can combine his medicines with thorough understanding. He may then escape the application of the satire of the late Professor James Gregory, of Edinburgh, that “it is easier to prescribe than to think.” The following list of ‘INCOMPATIBLES’ was prepared with considerable care by Dr. James Hamilton, of Baltimore, and was kindly placed at the author’s disposal. It has the advantage of the incompatible substances being in alphabetical order.

LIST OF CHEMICAL INCOMPATIBLES.

Absinthium, *Wormwood*.—Iron, sulphate of. Lead, acetate of. Zinc, sulphate of.

Acacia, *Gum Arabic*.—Acids. Alcohol. Ammonia. Ether, sulphuric. Iron, tincture of chloride of. Lead, acetate of. Soda, borate of.

Acidum Arseniosum, *Arsenious Acid*.—Bark, decoction of. Copper, sulphate of. Lime water. Silver, nitrate of. Potassium, iodide of. Potassa, sulpho-hydrate of.

Acidum Citricum, *Citric Acid*.—Acetates, alkaline. Acetates, metallic. Acid, nitric. Acid, sulphuric. Carbonates, alkaline. Carbonates, earthy. Carbonates, metallic. Potassa, tartrate of. Sulphurets, alkaline. Sulphurets, earthy. Soaps.

Acidum Hydrocyanicum, *Hydrocyanic Acid*.—Acids, mineral. Antimony, oxides of. Chlorine. Iron, salts of. Mercury, oxides of. Oxides generally. Silver, nitrate of. Sulphurets.

Acidum Muriaticum, *Muriatic Acid*.—Alkalies. Carbonates. Earths. Lead, acetate of. Oxides. Potassa, sulphate of. Potassa, tartrate of. Silver, nitrate of.

Acidum Nitricum, *Nitric Acid*.—Alcohol. Alkalies. Carbonates. Earths. Iron, protosulphate of. Lead, acetate of. Oils, essential. Oxides. Potassa, acetate of. Sulphurets. Zinc, sulphate of.

Acidum Oxalicum, *Oxalic Acid*.—Lime, salts of.

Acidum Sulphuricum, *Sulphuric Acid*.—Alcohol. Barium, chloride of. Calcium, chloride of. Carbonates. Chlorohydrates. Nitrates. Oils, essential. Organic substances. Oxides. Sulphohydrates. Vegetable astringent infusions.

Acidum Tartaricum, *Tartaric Acid*.—Alkalies. Carbonates, alkaline. Carbonates, earthy. Earths. Lead, salts of. Lime, salts of. Lime water. Mercury, salts of. Potassa, salts of. Vegetable astringents.

Adeps, *Lard*.—Alcoholic preparations. Decoctions. Infusions. Tinctures.

Ætheris Nitrici Spiritus, *Spirit of Nitric Ether*.—Guaiaac, tincture of. Iron, sulphate of.

Aloë, *Aloes*.—Mercury, nitrate of. Silver, nitrate of. Tin, protochloride of.

Aloes, Decoctum Compositum, *Compound Decoction of Aloes*.—Acids, strong. Antimony and potassa, tartrate of. Lead, acetate of. Mercury, chloride of. Zinc, sulphate of.

Alumen, *Alum*.—Alkalies. Alkaline salts. Ammonia, carbonate of. Ammonia, chlorohydrate of. Galls. Kino. Lead, acetate of. Lime water. Magnesia, carbonate of. Mercury, salts of. Potassa, tartrate of.

Ammonia Acetatis Liquor, *Solution of Acetate of Ammonia*.—Acids. Alkalies. Alum. Copper, sulphate of. Iron, sulphate of. Lime water. Lead, acetate of. Magnesia, sulphate of. Mercury, bichloride of. Silver, nitrate of. Zinc, sulphate of.

Ammonia Liquor, *Solution of Ammonia*.—Acids. Alum. Salts, metallic.

Ammonia Carbonas, *Carbonate of Ammonia*.—Acids. Alkalies, fixed. Alum. Carbonates, alkaline. Iron, sulphate of. Lead, acetate of. Lime. Lime, chloride of. Magnesia. Magnesia, sulphate of. Mercury, acetate of. Mercury, bichloride of. Mercury, protochloride of. Potassa, bitartrate of. Salts, acidulous. Zinc, sulphate of.

Ammonia Murias, *Muriate of Ammonia*.—Acid, sulphuric. Acid, nitric. Alkalies, fixed. Carbonates, alkaline. Iron, sulphate of. Lead, acetate of. Lime. Magnesia. Magnesia, sulphate of. Potassa. Potassa, carbonate of. Salts, metallic. Silver, nitrate of. Zinc, sulphate of.

Ammonia Spiritus Aromaticus, *Aromatic Spirit of Ammonia*.—Acids. Lime water. Salts, earthy. Salts, metallic. Salts, with excess of acid.

Amygdalæ Oleum, *Oil of Almonds*.—Acids. Mercury, bichloride of. Oxymel. Poppies, syrup of. Potassa, bisulphate of. Potassa, bitartrate of. Potassa, tartrate of. Resins. Squill, syrup of. Water, hard.

Angustura, *Angustura Bark*.—Acids, mineral. Antimony and potassa, tartrate of. Cinchona, infusion of. Copper, sulphate of. Galls, infusion of. Iron, sulphate of. Lead, acetate of. Lead, triacetate of. Mercury, bichloride of. Potassa. Silver, nitrate of.

Antimonii et Potassæ Tartras, *Tartrate of Antimony and Potassa*.—Acids, mineral. Alkalies. Carbonates, alkaline. Decoctions, bitter. Earths. Sulphohydrates. Infusions, bitter. Metals. Soaps.

Antimonii Sulphuretum Auratum, *Golden Sulphuret of Antimony*.—Acids. Salts, acidulous.

Anthemis, *Chamomile*.—Cinchona, infusion of. Iron, preparations of. Isinglass, solution of. Lead, acetate of. Lead, triacetate of. Mercury, bichloride of. Silver, nitrate of.

Argenti Nitras, *Nitrate of Silver*.—Acid, arsenious. Acid, chlorohydric and salts. Acid, sulphuric and salts. Acid, tartaric and salts. Alkalies, fixed. Earths, alkaline. Sulphohydrates. Soaps. Vegetable astringent infusions. Water, common.

Armoracia, *Horseradish*.—Carbonates, alkaline. Cinchona, infusion of. Galls, infusion of. Mercury, bichloride of. Silver, nitrate of.

Arnica, *Leopard's Bane*.—Acids, mineral. Iron, sulphate of. Lead, acetate of. Zinc, sulphate of.

Aurantii Cortex, *Orange-peel*.—Cinchona, infusion of. Iron, sulphate of. Lime water.

Auri Chloridum, *Chloride of Gold*.—Alkalies. Vegetable juices.

Barii Chloridum, *Chloride of Barium*.—Carbonates. Nitrates. Phosphates. Sulphates.

Bistorta, *Bistort*.—Gelatin. Iron, sulphate of.

Calamus, *Sweet Flag*.—Lead, acetate of.

Calcis Liquor, *Lime water*.—Acids. Borates. Citrates. Infusions, astringent. Salts, alkaline. Salts, metallic. Sulphur. Tartrates. Tinctures.

Calx Chlorinata, *Chlorinated Lime*.—Acid, sulphuric. Alkalies, fixed. Ammonia, carbonate of. Carbonates, alkaline. Sulphates.

Capsicum, *Cayenne Pepper*.—Alum. Ammonia. Carbonates, alkaline. Copper, sulphat^o of. Galls, infusion of. Iron, sesquisulphate of. Lead, acetate of. Mercury, bichloride of. Mercury, nitrate of. Potassa, carbonate of. Silver, nitrate of. Zinc, sulphate of.

Cardamomum, *Cardamom*.—Acids. Iron, sulphate of. Mercury, chlorides of.

Caryophyllus, *Cloves*.—Cinchona. Antimony and potassa, tartrate of. Iron, sulphate of. Lead, acetate of. Lime water. Silver, nitrate of. Zinc, sulphate of.

Cascarilla, *Cascarilla*.—Same as the preceding.

Catechu, *Catechu*.—Acid, chlorohydric. Acid, sulphohydric. Albumen. Alkalies. Baryta, solutions of. Gelatin. Lime water, and salts of lime. Salts, alkaline. Salts, metallic.

Centaurea Benedicta, *Blessed Thistle*.—Lead, acetate of. Silver, nitrate of.

Cinchona, *Peruvian Bark*.—Antimony and potassa, nitrate of. Carbonates, alkaline. Catechu, infusions of. Chamomile, infusions of. Columbo, infusions of. Iron, salts of. Lime water. Mercury, bichloride of. Rhubarb, infusion of. Silver, nitrate of. Zinc, sulphate of.

Coccus, *Cochineal*.—Iron, sulphate of. Lead, acetate of. Zinc, sulphate of.

Colchicum, *Colchicum*.—Acids.

Colocynthis, *Colocynth*.—Alkalies, fixed. Iron, sulphate of. Lead, acetate of. Lead, triacetate of. Lime water. Mercury, bichloride of. Silver, nitrate of.

Conium, *Hemlock*.—Vegetable acids.

Cupri Sulphas, *Sulphate of Copper*.—Alkalies, Ammonia, acetate of. Calcium, chloride of. Carbonates, alkaline. Lead, acetate of. Lead, triacetate of. Lime water. Mercury, bichloride of. Potassa, tartrate of. Silver, nitrate of. Soda, bichloride of. Vegetable astringent infusions. Vegetable astringent tinctures.

Cuprum Ammoniatum, *Ammoniated Copper*.—Acids. Alkalies, fixed. Lime water.

Digitalis, *Foxglove*.—Cinchona, infusion of. Iron, sulphate of. Lead, acetate of.

Diosma, *Buchu*.—Galls, infusion of. Iron, sulphate of.

Ferri Chloridi Tinctura, *Tincture of Chloride of Iron*.—Alkalies. Carbonates, alkaline. Mucilage. Vegetable astringent infusions.

Ferri et Potassæ Tartras, *Tartrate of Iron and Potassa*.—Acids. Lime water. Potassa, sulphohydrate of. Vegetable astringent infusions.

Ferri Sulphas, *Sulphate of Iron*.—Alkalies. Ammonia, acetate of. Ammonia, chlorohydrate of. Carbonates, alkaline. Earths. Lead, acetate of. Lead, triacetate of. Potassa, nitrate of. Potassa and soda, tartrate of. Salts, with base forming insoluble sulphates. Silver, nitrate of. Soap. Soda, bichloride of. Vegetable astringent infusions.

Ferrum Ammoniatum, *Ammoniated Iron*.—Alkalies. Carbonates, alkaline. Lime water. Vegetable astringents.

Galla, *Galls*.—Acid, chlorohydric. Acid, sulphuric. Antimony and potassa, tartrate of. Copper, sulphate of. Gelatin. Iron, salts of. Lead, acetate of. Lime water. Mercury, bichloride of. Mercury, nitrate of. Potassa, carbonate of. Salts, generally. Silver, nitrate of. Soda, carbonate of. Zinc, sulphate of.

Guaiaci Resina, *Guaiac*.—Acids, mineral.

Gentiana, *Gentian*.—Iron, sulphate of. Lead, acetate of.

Hæmatoxylon, *Logwood*.—Acid, acetic. Acid, chlorohydric. Acid, nitric. Acid, sulphuric. Antimony and potassa, tartrate of. Copper, sulphate of. Iron, sulphate of. Lead, acetate of.

Humulus, *Hops*.—Acids, mineral. Iron, salts of. Lead, salts of. Mercury, salts of. Silver, salts of.

Hydrargyri Chloridum Corrosivum, *Corrosive Chloride of Mercury*.—Almond mixture. Alkalies fixed. Ammonia. Antimony and potassa, tartrate of. Bismuth. Carbonates, alkaline. Copper. Iron. Lead. Lead, acetate of. Lime water. Mercury. Oils, volatile. Potassium, sulphuret of. Silver, nitrate of. Soap. Sulphur. Zinc. Chamomile, infusions of. Cinchona, infusions of. Columbo, infusions of. Horseradish, infusions of. Oakbark, infusions of. Senna, infusions of. Simaruba, infusions of. Tea, infusions of.

Hydrargyri Chloridum Mite, *Mild Chloride of Mercury*.—Acid, nitric. Alkalies. Antimony, golden sulphuret of. Carbonates, alkaline. Chlorine. Copper. Iron. Lead. Lime water. Potassium, sulphuret of. Soaps.

Hyoscyamus, *Henbane*.—Acids, vegetable. Iron, sulphate of. Lead, acetate of. Silver, nitrate of.

Ipecacuanha, *Ipecacuanha*.—Acids, vegetable. Galls, infusion of.

Kermes Mineralis, *Kermes Mineral*.—Acids.

Kino, *Kino*.—See Galla.

Krameria, *Rhatany*.—Acids, mineral. Gelatin. Iron, salts of.

Lavandula, *Lavender*.—Iron, sulphate of.

Limonis Cortex, *Lemon Peel*.—Acid, nitric. Acid, oxalic. Acid, sulphuric. Acid, tartaric. Lime water.

Lupulina, *Lupulin*.—Iron. Mercury, salts of. Platinum, salts of. Tin, salts of.

Magnesie Carbonas, *Carbonate of Magnesia*.—Acids. Alkalies. Alum. Copper, sulphate of. Iron, sulphate of. Lead, acetate of. Mercury, acetate of. Mercury, bichloride of. Potassa, bitartrate of. Salts, acidulous. Salts, neutral. Silver, nitrate of. Zinc, sulphate of.

Magnesie Sulphas, *Sulphate of Magnesia*.—Alkalies, fixed. Ammonia, muriate of. Barium, chloride of. Calcium, chloride of. Carbonates, alkaline. Lead, acetates of. Silver, nitrate of.

Marrubium, *Horehound*.—Iron, sulphate of.

Melissa, *Balm*.—Iron, sulphate of. Lead, acetate of. Silver, nitrate of.

Morphia, *Morphia*.—Oxides, metallic.

Morphia, Salts of.—Alkalies. Carbonates, alkaline. Decoctions of vegetable astringents. Infusions of vegetable astringents. Lime. Magnesia. Silver, nitrate of.

Moschus, *Musk*.—Cinchona, infusion of. Iron, sulphate of. Mercury, bichloride of. Silver, nitrate of.

Mucilago, *Mucilage*. Alcohol: Ammonia. Acids, strong. Ether, sulphuric, compound spirit of. Iron, chloride of, tincture of. Salts, metallic.

Opium, (solid.) *Opium*.—Alkalies. Cinchona. Galls. Lead, acetate of. Mercury, bichloride of.

Opium, (Infusion of, &c.)—Ammonia. Carbonates, alkaline. Copper, sulphate of. Galls, infusion of. Iron, sulphate of. Lead, acetate of. Mercury, bichloride of. Silver, nitrate of. Zinc, sulphate of.

Pimenta, *Pimento*.—Cinchona, infusion of. Iron, nitrate of. Iron, sulphate of.

Piper, *Black Pepper*.—Galls, infusion of.

Plumbi Acetas, Acetate of Lead.—Acids. Alkalies. Alum. Ammonia, solution of acetate of. Antimony and potassa, tartrate of. Carbonates, alkaline. Earths, alkaline. Chlorohydrates. Iron, ammoniated. Iron and potassa, tartrate of. Soaps. Soda, biborate of. Sulphates. Sulphurets. Water, common.

Plumbi Subacetatis Liquor, Solution of Subacetate of Lead.—Alkalies. Carbonates, alkaline. Mucilage. Soap liniment. Sulphates, alkaline. Sulphurets of alkaline metals.

Potassæ Acetas, Acetate of Potassa.—Fruits, acid. Acids, mineral. Tamarinds. Salts, acid. Salts, alkaline. Salts, metallic.

Potassæ Arsenitis Liquor, Solution of Arsenite of Potassa.—Cinchona, infusion of. Copper, salts of. Lime water. Potassa, sulphohydrate of. Silver, nitrate of.

Potassæ Carbonas, Carbonate of Potassa.—See *Potassæ bicarbonas*.

Potassæ Bicarbonas, Bicarbonate of Potassa.—Acids. Alum. Ammonia, acetate of. Ammonia, carbonate of. Ammonia, muriate of. Antimony and potassa, tartrate of. Copper, acetate of. Copper, sulphate of. Iron, chloride of. Iron and potassa, tartrate of. Iron, sulphate of. Lead, acetate of. Lime water. Magnesia, sulphate of. Mercury, bichloride of. Mercury, protochloride of. Silver, nitrate of. Salts, acidulous. Soda, biborate of. Zinc, sulphate of.

Potassæ Nitras, Nitrate of Potassa.—Acid, sulphuric. Alum. Copper, sulphate of. Iron, sulphate of. Magnesia, sulphate of. Soda, sulphate of. Zinc, sulphate of.

Potassæ Sulphas, Sulphate of Potassa.—Acid, chlorohydric. Acid, nitric. Lead, acetate of. Lime and compounds. Mercury, bichloride of. Silver, nitrate of.

Potassæ Tartras, Tartrate of Potassa.—Acids. Barium, chloride of. Lead, acetates of. Lime. Magnesia. Salts, acidulous. Silver, nitrate of. Tamarinds. Vegetables, acid.

Potassæ Bitartras, Bitartrate of Potassa.—Acids, mineral. Alkalies. Earths, alkaline.

Potassii Sulphuretum, Sulphuret of Potassium.—Salts, metallic. Water.

Quassia, Quassia.—Lead, acetate of. Silver, nitrate of.

Quercus, Oak Bark.—Alkalies. Carbonates, alkaline. Cinchona, infusion of. Iron, salts of. Isinglass, solution of. Lead, acetates of. Lime water. Mercury, bichloride of. Zinc, sulphate of.

Quinæ Sulphas, Sulphate of Quinia.—Alkalies. Earths, alkaline. Infusion of orange-peel, compound. Infusion of Roses. Solutions, astringent. Tincture of cinchona.

Rheum, Rhubarb.—Acids, strong. Antimony and potassa, tartrate of. Angustura, infusions of. Catechu, infusions of. Cinchona, infusions of. Galls, infusions of. Iron, sulphate of. Lead, acetate of. Mercury, bichloride of. Silver, nitrate of. Zinc, sulphate of.

Rosa Gallica, Red Roses.—Gelatin. Iron, sulphate of. Lime water. Zinc, sulphate of.

Salix, Willow.—Ammonia, carbonate of. Gelatin. Iron, sulphate of. Lime water. Potassa, carbonate of. Zinc, sulphate of.

Saliva, Sage.—Iron, salts of.

Sapo, Soap.—Acids. Alum. Antimony and potassa, tartrate of. Calcium, chloride of. Copper, ammoniated. Copper, sulphate of. Iron, ammoniated. Iron and potassa, tartrate of. Iron, sulphate of. Lead, acetate of. Magnesia, sulphate of. Mercury, acetate of. Mercury, bichloride of. Mercury, protochloride of. Salts, acidulous. Silver, nitrate of. Vegetable astringent infusions. Zinc, sulphate of.

Sarsaparilla, Sarsaparilla.—Lead, acetate of. Lime water. Mercury, nitrate of.

Scammonium, Scammony.—Acids.

Scilla, Squill.—Alkalies.

Senna, Senna.—Acids, strong. Antimony and potassa, tartrate of. Cinchona, infusion of. Lead, acetate of. Lime water. Mercury, bichloride of. Silver, nitrate of.

Serpentaria, Virginia Snake Root.—Lead, acetate of.

Simaruba, Simgruba.—Carbonates, alkaline. Catechu. Cinchona. Galls. Lead, acetate of. Lime water. Mercury, bichloride of. Silver, nitrate of.

Sodæ Boras, Borate of Soda.—Acids. Ammonia, chlorohydrate of. Ammonia, sulphate of. Chlorohydrates, earthy. Potassa. Sulphates, earthy.

Sodæ Carbonas, Carbonate of Soda.—See *Potassæ Carbonas*.

Sodæ et Potassæ Tartras, Tartrate of Soda and Potassa.—Acids. Ammonia, muriate of.

Baryta, salts of. Lead, acetates of. Lime, salts of. Magnesia, sulphate of. Potassa, sulphate of. Salts, acidulous. Soda, sulphate of. Tamarinds.

Sodæ Phosphas, *Phosphate of Soda*.—Acid, chlorohydric. Acid, nitric. Acid, sulphuric. Barium, chloride of. Lime. Magnesia.

Sodæ Sulphas, *Sulphate of Soda*.—See Magnesîæ Sulphas.

Stramonium, *Stramonium*.—Acids, mineral. Iron, salts of. Lead, salts of. Mercury, salts of. Silver, salts of.

Tamarindus, *Tamarinds*.—Antimony and potassa, tartrate of. Carbonates, alkaline. Lime water. Potassa, salts of.

Taraxacum, *Dandelion*.—Galls, infusion of. Iron, sulphate of. Lead acetate of. Mercury, bichloride of. Silver, nitrate of.

Tormentilla, *Tormentil*.—Alkalies. Earths, alkaline. Iron, salts of. Isinglass, solution of.

Valeriana, *Valerian*.—Iron, salts of.

Zinci Sulphas, *Sulphate of Zinc*.—Alkalies. Earths. Milk. Sulphohydrates. Vegetable astringent infusions.

The prescriber, who is well acquainted with chemistry, may throw together in the same prescription substances that are really incompatible, and act upon and modify each other; but he does this understandingly; and with the view of obtaining a new compound. The Pharmacopœia of the United States contains formulæ for various preparations produced by double decomposition. *MISTURA FERRI COMPOSITA* has been considered an unchemical compound, because carbonate of potassa and sulphate of iron are ingredients; and it would be objectionable, were the prescriber to believe, that each of these agents exerts its own powers when the compound is taken. Such is not, however, his belief. He is desirous of administering an oxide of iron, and he knows that this must be the result of the mutual decomposition of those salts. Hence, the formula is chemical and philosophical. The same remarks apply to *PILULÆ FERRI COMPOSITÆ* of the pharmacopœias; and to *black wash*, (Vol. ii. p. 296,) and *yellow wash*, (Vol. ii. p. 296;) the former made by the admixture of lime water and mild chloride of mercury, and the latter of lime water and corrosive chloride of the same metal. In all these cases, the physician is desirous of producing, by chemical decomposition, a resulting agent, which he knows by experience to be capable of exerting definite powers.

Such are the chief points for the guidance of the young practitioner in the "art of prescribing." In works on therapeutics, the whole subject is so clogged with difficulties and cautions, that he is apt to regard it as a hopeless task; and if he were to take those works as his guides, it would not be easy for him to proceed. The matter is really, however, more simple. At the outset of his career, when he has examined fully into the history and nature of any case that presents itself to his notice;—laid down his indications, and taken into consideration all those circumstances, that modify the indications, he decides upon the agent which he considers best adapted for fulfilling them, and upon the dose in which he thinks it ought to be given. He then reflects, whether it require the addition of any other agent that may add to its powers, and whether there be any unpleasant action apt to be induced by it, which may demand an addition to the prescription to obviate it. In

making these additions he must be careful, that there is no resulting incompatibility—therapeutical or chemical—unless he is desirous of producing a third substance from the action of the ingredients upon each other, which may possess different properties than either article taken singly.

Throughout the preceding pages, it has been seen, that the form in which a therapeutical agent is prescribed is not always a matter of indifference. In many cases, powders disagree;—at times, in consequence of the unpleasant impression made by them on the nerves of taste; at others, owing to their exciting nausea or vomiting, or both, by the impression they make on the stomach. Hence, in cases of atony of that organ, owing either to convalescence from acute diseases, or to chronic diseases,—as chronic dyspepsia,—the physician prefers to administer tonics in the form of infusion, by which he gets rid of the insoluble woody matter. Where, however, he is desirous of making a powerful impression on the stomach, and through it on the organism—as in a case of intermittent fever, to break in upon the chain of associated actions, that give occasion to the recurrence of the paroxysms—he prefers to administer cinchona in powder; and often finds that it succeeds, when other forms of preparation, and sulphate of quinia had failed. The pilular form is generally chosen, where the article is of nauseous taste, and—in the case of cathartics—where it is not desired that the operation should be speedy. There are substances, too, which, like mild chloride of mercury, are so heavy that they could not be taken in any ordinary thin vehicle; but even these may be administered in thick fluids, as molasses or syrup. Where it is desirable, that the medicine should produce its effects soon; and *à fortiori*, to impress powerfully the gustatory nerves as well, the form of mixture is always chosen. Many cathartics are accordingly given in mixture; nauseous antispasmodics are prescribed in the same form; and—as has been remarked under the appropriate head—sulphate of quinia acts more satisfactorily in solution than in substance.

Throughout this work, the doses of medicines have been given as they apply to the adult male; but various circumstances materially modify these, and in modes that have been referred to under the different classes, or under individual articles. Those circumstances, too, which have been described as modifying the therapeutical indications, as age, sex, original conformation, habit, climate, mental affections, way of life, causes, seat, period, &c., of the disease,—may equally modify them. (See Vol. i. p. 45.) The greatest difficulty with the young practitioner is to apportion the dose to the age. As a general rule, the dose diminishes in an inverse ratio with the age; children requiring a much smaller quantity of most medicines. In old age, again, the doses may usually be smaller; yet, owing to the blunted sensibility, certain agents require to be administered in larger quantities. The following tables of doses by Gaubius and Dr. Thomas Young may be regarded as approximations, which may serve to a certain extent as guides. The estimates of Gaubius were made from the results of ob-

servation. Those of Dr. Young are based upon a formula, the results of which correspond closely with those of Gaubius. "The doses of most medicines for children under twelve years of age," he observes, "must be diminished in the proportion of the age to the age increased by 12; thus, for example, at two years $\frac{2}{12} = \frac{1}{6}$

Dose for an adult, from 20 to 60 years of age,		GAUBIUS.		YOUNG.	
For a child under one year,	1-15 to 1-12	3j or gr. 60.	1-13	3j or gr. 60.	
" two years old,	1-8	gr. 4 to 5.	1-7	gr. 4 $\frac{1}{2}$	
" three years,	1-6	gr. 7 $\frac{1}{2}$	1-5	gr. 8 $\frac{1}{4}$	
" four year,	1-4	gr. 10.	1-4	gr. 12.	
" seven years,	1-3	gr. 15.		gr. 15.	
" fourteen years,	1-2	gr. 20.		gr. 22.	
For a man twenty years old,	2-3	gr. 30.		gr. 32.	
		gr. 40.		gr. 37 $\frac{1}{2}$	

Yet numerous exceptions occur to any rule of this kind. For example, children under two years of age are not very susceptible to the action of mercury. It is, indeed, exceedingly difficult to salivate them at this age, even when large doses of calomel are given; yet, at the age of three or four, they are very readily influenced by mercurials. The ordinary dose of calomel, again, for a child of the age last mentioned, is generally enough to operate on the adult. In infancy, on the other hand, the susceptibility to the action of narcotics is great, so that the dose has to be reduced below the ordinary average applicable to other remedies;—but these are points that have been referred to elsewhere.

In the different formulæ, and in apportioning the doses of medicines, the weights and measures used are those of the Pharmacopœia of the United States of America; but it is not uncommon to direct modes of apportionment that are liable to vary in consequence of the want of uniformity in the size of the instruments employed for the purpose. Still, they are presumed to average as follows:—a CUPFUL (*Cyathus*), contains f.3ivss; a WINEGLASS (*Cyathus vinarius*), from f.3iss to f.3ij; a TABLE-SPOONFUL (*Cochleare amplum*), f.3ss; a DESERT-SPOONFUL (*Cochleare medium*), about f.3ij; a TEASPOONFUL (*Cochleare parvum*), about f.3j. None of these measures can be used, where great exactitude is required. Many teacups, for example, contain six fluidounces; and the breakfast cups twelve. Wine-glasses, too, are of various sizes, as well as spoons. When great nicety is not required, the physician often directs important articles to be given by drops; but this is an unsatisfactory method compared with that of dispensing them by the minim measure. A fluidrachm is divided into 60 portions, and each of these is termed a *minim*. The *minim* must, therefore, always be of the same size, whatever may be the character of the fluid; but this cannot be the case with the drop, which differs materially according to the lip of the vessel, nature of the fluid, &c.

The great difference between the size of the *minim* and the drop of various fluid preparations is exhibited in the following table. The results were obtained by Mr. Durand, a skilful *Pharmacien* of Philadel-

phia, under circumstances, as regards the different articles, as nearly identical as possible.

<i>One fluidrachm of</i>		<i>Drops.</i>
Acid, acetic (crystallizable,) - - -	contains	120
— hydrocyanic, (medicinal,) - - -	- "	45
— muriatic, - - -	- "	54
— nitric, - - -	- "	84
— diluted, (1 to 7,) - - -	- "	51
— sulphuric, - - -	- "	90
— aromatic, - - -	- "	120
— diluted, (1 to 7,) - - -	- "	51
Alcohol, (rectified spirit,) - - -	- "	138
— diluted, (proof spirit,) - - -	- "	120
Arsenite of potassa, solution of, - - -	- "	57
Ether, sulphuric, - - -	- "	150
Oils of aniseed, cinnamon, cloves, peppermint, } sweet almonds and olives, }	- "	120
Solution of ammonia, (strong,) - - -	- "	54
— (weak,) - - -	- "	45
Tinctures of assafetida, foxglove, guaiac and opium, - - -	- "	120
— of muriate of iron, - - -	- "	132
Vinegar, distilled, - - -	- "	78
— of colchicum, - - -	- "	78
— of opium, (<i>black drop</i>), - - -	- "	78
— of squill, - - -	- "	78
Water, distilled, - - -	- "	45
Wine, (Teneriffe,) - - -	- "	78
— antimonial, - - -	- "	72
— of colchicum, - - -	- "	75
— of opium, - - -	- "	78

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greater dictum
antennae are potential and actual.
they are of great utility in many
diseases. - they are used for the dis-
tinction of parts - as cancer, vegeta-
tion, growths, atonic ulcers, paralysis,
and rheumatic affection generally.
also to subdue inflammation.

antennae are generally used in
skin diseases. their value seems
to be in their applicability to these
affections. for sargles see dissection

444
244
195
32

John S. Means.



